THE TEXTILE MANUFACTURER

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Notes of the Month

RECORD SALES OF BRITISH CARPETS

On a square yardage basis, more carpets were sold by the British industry than ever before, according to the 1958 report of the Federation of British Carpet Manufacturers. Total output by members of the federation was 36·8 million sq. yds., an increase of 8% on the previous year, and total sales, ex-factory, set up another record at £71·1 million, which was about 11% higher than in the previous year. The report points out that sales and turnover should not be confused with profitability, as the industry works on a narrow margin of profit owing to severe internal and external competition, and the profit margin is probably smaller than in other comparable consumer goods industries. In the past year, spool and gripper Axminster carpet productions increased by a little over 11%, Wilton production by 8½%, but chenille Axminster carpeting fell by 10% compared with 1957. Output of Axminster carpets is now twice as large as before the war.

The report, quoting the British Carpets Promotion Council, stated: "Continuous joint sales promotion by the industry is paying back good dividends. It is creating a more widely based market for the manufacturer, the wholesaler and retailer, and at the same time encourages the consumer to think in terms of the better quality traditional carpet in spite of heavy competition from the merchandising of cheaper floor coverings. These favourable conditions (in 1958) plus the proposed Government help to the public with regard to the purchase of new and older type houses, and the continuing freer interchange of housing units, should help greatly in maintaining the momentum of the carpet market in the coming year."

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D.S.I.R. ANNUAL REPORT

The report of the Council for Scientific and Industrial Research for 1958 is now published and at a press conference, Sir Harry Jephcott (chairman, Research Council) said that in the period under review they were taking action on what they had found out as a result of a thorough survey of many aspects of the Department's work. He went on: "We have reached a much clearer picture of the way the Department should go. One discovery was that the amount of money spent on research at universities was not adequate, and we decided to increase our grants for special researches. The amount has already been increased and by the end of the second five-year plan there will be a really worthwhile effort." The most interesting aspect of the report was the planning for the second five-year plan. D.S.I.R. was exceptionally fortunate in being permitted to budget for a five-year period. It was a valuable arrangement and almost essential to council's task. Sir Harry emphasised, however, that they were keeping the plan flexible. "World conditions are changing rapidly and the Department must be ready to help in changing them—ready to experiment with new ideas and to alter its policy and organisation as the need arises." He recalled that last year council had said that the research effort must be increased and the Department had a large part to play. "You will notice that the Government has acted on this recommendation," he said. "Whereas the Department received £36 million over the last five-year plan, we shall receive £61 million over the second five-year plan. This is a handsome increase although, of course, one can never be satisfied where research is concerned."

Dealing with council's proposal to support valuable research and development ideas in industry, Sir Harry said: "This is an entirely new idea. It is in the early stages and I can say little about it at the moment—but we think that this may turn out to be one of the most valuable and exciting of our new ideas." He then dealt with criticisms of the Research Associations. When the Research Council said that they would report on the Research Association movement this was assumed in some quarters to imply that the council thought that things were seriously wrong with the movement. The Industrial Grants Committee had now carried out an extensive investigation of the movement and of its value to the country as a whole. On grants for special researches, he said: "The grants for special researches at universities are being greatly increased. There are a number of reasons, but one of the most important is that as universities expand and the number of students and post-graduate students who are taking scientific and technological subjects increases, so it is necessary for the research staff of the universities to expand also."

* * *

GOVERNMENT PLAN FOR LANCASHIRE

The Government White Paper containing details of the £30,000,000 five-year plan for reorganising the Lancashire cotton industry emphasises the need "for the utmost speed at all stages" to implement the proposals. Urgency, it is pointed out, is essential if the industry is to take advantage of the period of stability offered by the recent Hong Kong agreement and the similar hoped for limitation of exports from India and Pakistan. The key to the Government's plan is that the elimination of excess productive capacity must be assured before modernisation and re-equipment are worthwhile and that the financial assistance—two-thirds of the cost of compensating firms who eliminate excess capacity and 25% towards the cost of modernising existing, and installing new, equipment in those firms remaining in the industry—is conditional upon agreed compensation being paid. "Reorganisation," it is pointed out, "is not worth doing if it is not done thoroughly." Opinions vary about the extent of the excess capacity, of course, but the White Paper sets out for the first time the industry's own

views on the total of excess capacity, also the estimated cost of re-equipment.

Spinning.—The Federation of Master Cotton Spinners' Associations believe the full measure of the extent of excess capacity to be in the region of 12,000,000 mule equivalent spindles. The Cotton Yarn Doublers' Association also estimate that the amount of surplus capacity in this section of the industry at about 1,200,000 spindles (i.e., about 60%). The condenser spinners estimate surplus in their section at about 10%.

Weaving.—The Cotton Spinners' and Manufacturers' Association have suggested that the aim should be to reduce capacity in the weaving section by at least 70,000 looms. (In weaving, there were approximately 240,000 looms in place in running mills in February this year.)

Finishing.—According to the White Paper, the position in printing, bleaching, yarn and piece-dyeing sections is much more complicated owing to the variety of equipment and processes involved, and the fact that certain machinery is required sometimes and not others due to short-term changes in requirements. The various sections, however, assess excess capacity at from 25 to 40%.

Out-of-Date Machinery.—The Federation of Master Cotton Spinners estimate that the cost of re-equipping or completing the re-equipment and modernisation of the remaining spinning capacity might amount to £40,000,000 and the Cotton Yarn Doublers' estimate the figure for their section to be £8,000,000. As regards the remaining weaving capacity, representatives have indicated that their cost might amount to £30 - £45,000,000 in all. In the finishing sections the main problem is primarily one of eliminating surplus capacity and reorganising remaining capacity rather than re-equipment.

The Cotton Board will be responsible both for the reorganisation schemes and the arrangements for giving financial assistance for modernisation and re-equipment. After consultation with both sides of industry the Board will submit reorganisation schemes to the Board of Trade for confirmation and then carry them out when approved by Parliament. The compulsory levies on the various sections will be collected by the Board. Every re-organisation scheme will be subject to a closing date before which firms wishing to apply for compensation for scrapping machinery must do so. This period will be short, e.g. the White Paper suggests a month. Compensation will only be paid for surplus machinery which is physically scrapped.

Pointing out that it is important that the new equipment should be employed to maximum advantage, the Government warns that reorganisation will fail unless management and labour are willing to co-operate in the introduction of new methods and in the extended shift-working without which the installation of expensive new machinery will be uneconomic. "This implies that full advantage will be taken of existing agreements and that no difficulty will arise over the introduction of extended shift-working in re-equipped mills in order that they may be operated as economically as possible." While the Government expect that the great bulk of the machinery required for re-equipment will be obtainable from British manufacturers, it will not be a condition of the grant that such equipment be purchased in this country. Mills will be free to buy the machinery best suited to their needs, but U.K. textile machinery makers are unlikely to have difficulty in meeting reasonably phased demands arising under the re-equipment arrangements as well as in maintaining their valuable export trade. The Cotton Board will act in the scheme through a special committee comprising the three existing independent members—including the chairman, Lord Rochdale, helped by two new members, an independent industrialist and an independent trade unionist.

According to the White Paper, the large majority of those now employed in the industry will gain increased security in their jobs, if the proposals are carried out but, it goes on to say, that the closure of mills no longer required is bound to cause some hardship. "The Government has very much in mind the older men and women who have given a lifetime to acquire the skills of their trade, some of them living in areas where it may be difficult to find alternative work near their homes." The employers have assured the Government that the industry will do its utmost to absorb displaced labour and the Government, on its part, will assist both through the Ministry of Labour and in efforts to attract new industry. Representatives of the spinning and weaving employers' federations and the unions have already agreed on the scale of compensation to be paid to workers who lose their jobs under the reorganisation schemes. A scale of compensation payments has been devised calculated on the earnings of the worker for a normal week and varying according to age. It was regarded as inadvisable to assess compensation according to length of service because of the difficulty of proving how long a man had worked in various mills over the years. On the scale agreed upon, an operative losing his or her job at the age of 21 will receive one week's wages in compensation. If they lose their jobs at 40 they will get seven weeks' wages, aged 50 fourteen weeks' wages, aged 60 twenty-two weeks and at 65 years or over thirty weeks' wages.

In principle, the reorganisation plan is excellent. It is a voluntary operation with no compulsion on any mill to close. Surprise—and disgust—have been expressed, however, at the extent of the contraction envisaged and at the extremely short time extended to mill owners to submit schemes. This apparent determination to stampede things through is hard to understand in view of the Government's attitude towards the industry during the last few years. As already mentioned the cost to the tax-payer will be in the region of £30,000,000 over five years. "That," observes the Government, "is a large sum but it is justified by the scale of the reorganisation required and the importance of the industry." It may seem a large sum but the fact remains that the spinning and weaving sections alone have invested over £100,000,000 since the war in capital equipment. What kind of a miracle is the industry now expected to achieve with less than one-third of this amount? However, the desperate situation has finally been fully realised and it is certainly not too late to re-form the entire structure of the industry on the most efficient lines. Scrapping old plant and machinery and re-equipping with new will not alone guarantee the future of the industry. If the whole scheme is to succeed it must have within its framework the distinct advantages of the highest productive possibilities, reasonable flexibility and with less labour requirements in order that the price of goods to the consumer ensure steady year round sales and work, and some increase in demand from overseas markets. Prices are, in most cases, the only answers to these problems. Manufacturing efficiency is just one aspect of the efforts to find a solution and the merchants and distributive trades could help enormously in streamlining their methods, margins and the extent of their co-operation. All sections of the industry must adapt themselves to the changed conditions and to the further changes arising from the full implementation of the reorganisation proposals. It is a challenge that must be accepted by all—employers, unions, machinery and accessory manufacturers, and everyone dependent on the industry for their well-being.

Cotton: Constitution, Properties and Uses

Cotton never quite remains the same basic commodity; its properties are constantly being improved. Plant breeders introduce better varieties and chemists are modifying the fibre to impart new features

By J. W. S. HEARLE, M.A., PH.D., A.INST.P.*

COTTON is composed mainly of cellulose, i.e. 94% of dry weight in a typical fibre. The other constituents include varying amounts of absorbed water, and small quantities of protain (1·3%); pectic substances (0·9%); mineral salts (1·2%); wax (0·6%); organic acids (0·8%); sugars (0·3%); and other substances (0·9%). Cellulose is a natural polymer: its molecules are long chains of identical units, about 2,000 joined together in each molecule in cotton. Fig. 1 shows that the individual units closely resemble glucose molecules and it should, in fact, be possible to synthesise cellulose by a reaction in which glucose molecules join end to end with the elimination of water molecules. This has not yet been achieved, however, except by plants or bacteria. The principal physical features of cellulose molecules are shown in Fig. 2a, b and c, together with photographs of a model of the molecule. The long chain of the molecule is to some extent flexible, since it can bend at the oxygen (O) bridges joining the rings of atoms together. It is a very strong chain. If the whole strength of the molecules could be utilised with perfect efficiency, the resulting fibre would be ten times stronger than any fibre known to-day. The weakness of actual fibres is due

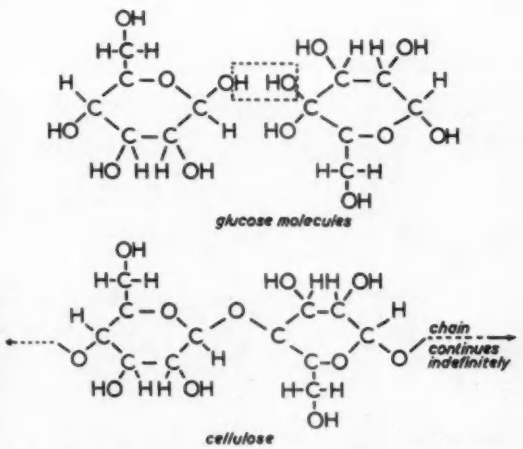

Fig. 1. Individual units showing close resemblance to glucose molecules

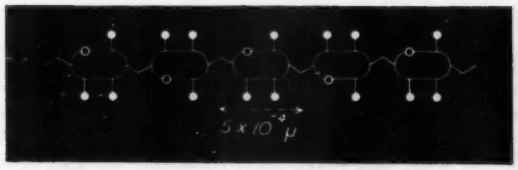

Fig. 2a. Physical features of cellulose molecule

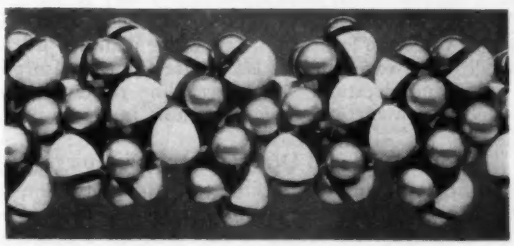

Fig. 2b. Photograph of model of cellulose molecule. In this plane, the chain cannot bend (courtesy, Courtaulds Ltd.)

to an uneven sharing of the load between the molecules, so that the few carrying the highest load break first and set off the complete breakage of the fibre.

An important feature of cellulose molecules are the hydroxyl (—OH) groups which stand out of the chain. These attract one another, so that neighbouring chains are readily held together. They also attract water molecules. The bonds between the hydroxyl groups are known as *hydrogen bonds* and, while they are not as strong as those holding the individual atoms together in a molecule, they are much stronger than the usual forces between separate molecules. These attractive forces cause the molecules to pack together in the regular, crystalline pattern illustrated in Fig. 3. The presence of this crystalline packing is an essential feature of most fibres, since it keeps the chain molecules lined up, and prevents them dispersing into the random tangled network of the molecules in a rubbery material.

However the whole of the fibre is not crystalline. In cotton, about two-thirds is crystalline and one-third non-crystalline. At present differences of opinion exist concerning the way in which the crystalline and non-crystalline regions are distributed in the fibre, but a typical suggestion for the structure is shown at Fig. 4. What seems

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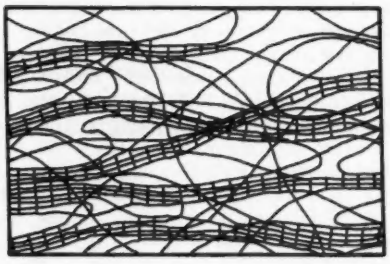
(left) Fig. 2c. In a plane at right-angles, the molecule can bend to some extent. The scale is in Angstrom units (courtesy Courtaulds Ltd.)

Fig. 3. Schematic view of packing of molecules in crystal



(right) Fig. 4. Possible arrangement of molecules in crystalline and non-crystalline regions

certain is that the crystallites are small with only about 50 molecules in their cross-section; and that individual molecules pass alternately through crystalline and non-crystalline regions several times along their length. The lengths of the crystalline regions are less certain: some scientists incline to the view that they are short tablets, only 100 units long while others think they are long fibrils. The combination of crystalline and non-crystalline regions linked together in the same network is a very valuable one in fibres. The crystalline regions provide cohesion and strength while the looser, non-crystalline material provides flexibility and extensibility, also space for the absorption of water and dyestuffs. The crystalline regions are not accessible to water and other chemicals in this way.

Forms and Dimensions of Fibres

The first part of a cotton fibre to be formed is the thin outer or primary wall, but the bulk of the fibre is composed of the secondary wall which is laid down in daily growth layers inside the primary wall. In the secondary wall, the material appears to be in the form of fibrils which spiral round the axis of the fibre as shown in Fig. 5. At intervals the spirals reverse in direction. The spiral angle varies with the type of cotton, ranging between 20° and 45°. At the centre of the fibre is the lumen through which the materials necessary for growth are supplied by the plant.

When the boll opens, cotton fibres appear as hollow circular tubes (Fig. 6) but as the material dries, the tube collapses, and convolutions appear, coinciding with the reversals in the spiral structure. The complete fibre, illustrated in Fig. 7, appears as an irregularly twisted, flattened tube. The base is a membrane extending into the seed coat and is usually broken off, and the tip tapers off into a thin portion with no lumen and no convolutions. In the rest of the fibre, there are between 200 and 300 convolutions per inch.

The difference between mature and immature fibres is shown in Fig. 8. The immature fibres are thin-walled tubes, and they collapse into thin flat fibres that easily tangle up into neps.

The lengths of cotton fibres range from $\frac{1}{2}$ to $2\frac{1}{2}$ ins., and their diameters from 12 to 25 microns.

The ratio of length to thickness consequently lies between 1,000 for a short, coarse staple and 4,000 for a long, fine variety. Scaled up, this is equivalent to 100 yds. × width of a thumb. Within any sample of cotton there is a considerable range of lengths, fineness and maturity, as revealed by the staple array and the cross-sections shown in Fig. 9.

There are also considerable differences in length and fineness between the different varieties of cotton. It is

Fig. 5 Photomicrograph of cotton, showing spiral arrangement of fibrils, with a reversal in the direction of spiralling (courtesy U.S. Dept. of Agriculture)

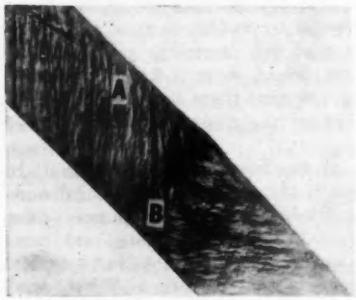


Fig. 6. Fibre convoluting as it dries (courtesy, U.S. Department of Agriculture)

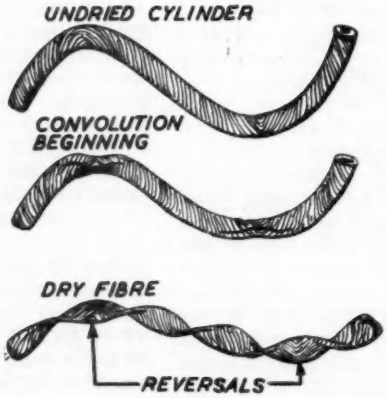
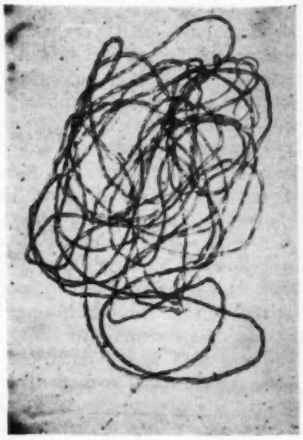
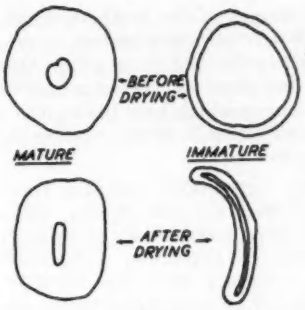
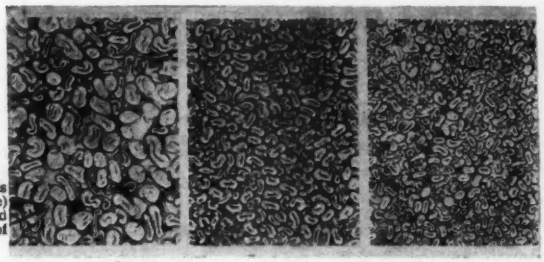


Fig. 7. Portrait of a complete cotton fibre (courtesy, U.S. Department of Agriculture)





(left) Fig. 8. Mature and immature fibres



(right) Fig. 9b. Sections of various types of cotton, (left) Asiatic, (centre) American Upland, (right) Sea Island (courtesy, U.S. Department of Agriculture)

Table 1. Commercial Types of Cotton

Staple length	Fineness millitex	Diam. microns	Texture	Strength	Examples
Long 1-2½ ins.	110-180	11-15	Fine Good lustre		Sea Island Egyptian American/ Egyptian
Intermediate ¾-1⅛ ins.	140-220	13-17	Medium	Medium	American Upland types some Peruvian
Short ¾-1 in.	150-290	14-22	Coarse No lustre	Weak or medium	Asiatic or Indian some Peruvian

convenient to divide commercial cottons into three categories:—

(1) **The long, fine cottons, of which the Sea Island cottons grown in the West Indies are the best examples.**
(2) **Intermediate cottons, including the vast American Upland production.**

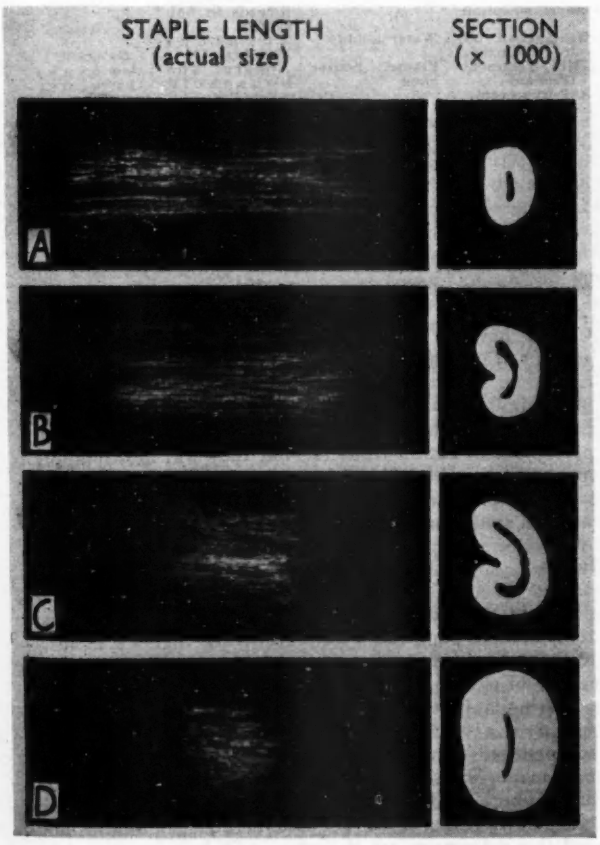


Fig. 9a. Staple lengths and mature sections of various types of cotton. A—Sea-Island (St. Vincent), B—Sudan (Gezira), C—American (Texas), D—India (Bengals) (courtesy Cotton Board)

(3) **Short, coarse cottons of the Asiatic type.**

The main features of these cottons are also set out in Table 1.

Fibre Characteristics

The properties of cotton are summarised in Table 2. Mechanically, cottons show moderate strength and extensibility, and typical load-elongation curves are given in Fig. 10. In general, the finest cottons are the strongest and most difficult to extend. One extremely interesting feature is that cotton is stronger wet than dry. Moderate is a term which can be applied to many properties of cotton. For instance in moisture absorption it lies half-way between synthetic fibres, which absorb no water, and wool and rayon which absorb a lot. The moderate absorption of cotton is sufficient to make it a comfortable material to wear; and to give it a low electrical resistance, so that troubles from static electricity are rare. Chemically, cotton is fairly reactive, so that it is easy to dye. It is attacked by strong acids and alkalis, and is also liable to rot in damp conditions as a result of the action of micro-organisms; it also suffers some degradation and yellowing by the action

Table 2. Properties of Cotton

	St. Vincent (Sea Island)	Texas (American)	Bengals (Indian)
Tenacity, g./tex.	46	25	19
Breaking extension, %	6·8	7·2	5·6
Work of rupture, g./tex.	1·52	0·86	0·51
Initial modulus, g./tex.	740	450	400
Elastic recovery from:—			
Half breaking load	0·48	0·47	0·56
Half breaking extension	0·66	0·68	0·65
(Wet strength/dry strength) × 100%	110-130		
Density, gm./c.c.	1·55		
Moisture regain at 65%, r.h.	8·5%		
Refractive index:—			
Light vibration, ∥ axis	1·58		
Light vibration, ⊥ axis	1·53		
Electrical resistance at 65%, r.h. (ohm. - gm./cm.²)	7·0 × 10⁸		
Effect of sunlight, prolonged exposure	Loss of strength; yellowing		
Attack by moths	Not attacked		
Attack by mildew	Attacked, especially if sized		
Effect of strong acids	Disintegrated by hot dilute or cold con.		
Effect of strong alkalies	Swelling and mercerisation		
Effect of organic solvents	Resistant		

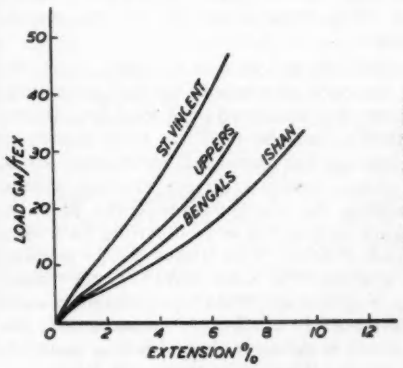


Fig. 10a. Various types of cotton

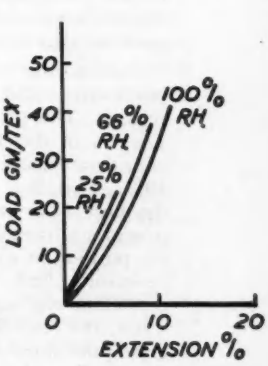


Fig. 10b. Effect of humidity

of sunlight. Cotton prices reached a maximum value in 1951 but they have fallen appreciably since then, as indicated by the typical examples given in Table 3.

Table 3. Cotton Prices (Pence per lb.)

	Annual averages				
	1938	1948	1951	1955	1957
American middling, $\frac{7}{8}$ in.	5·1	22·8	46·5	31·8	25·3
Egyptian Ashmouni .. .. (Good/Fully good)	7·5	34·3	60·9	36·5	41·7

Prices — January 1959	
American middling, $\frac{7}{8}$ in.	22·10
„ 1 in.	23·70
East African (No. 2, B.S.G.)	25·25
Peruvian Tanguis, good, 1$\frac{1}{8}$ in.	27·50
Nigerian, N.A.2	23·75
Syrian, No. 1, roller-ginned	24·25
„ saw-ginned	24·00
Mexican middling, 1$\frac{1}{16}$ ins.	23·70
Turkish Adana, No. 2	21·00
Turkish Adana, No. 3	20·25
Sudan Sakel, No. 6	27·00
„ Lambert, No. 6	26·25

Modification of Cotton

Over a hundred years ago John Mercer discovered that cotton fibres swelled when treated with strong caustic soda. Later it was found that if this treatment was applied to yarn or cloth, without allowing any shrinkage to occur, a high lustre and improved strength was the consequence. Since then mercerised cotton has been widely used where lustrous cotton fabrics are desired. The process of mercerisation results in a rearrangement of the cellulose molecules—the swelling action penetrates the crystalline regions and disperses the molecules. When the alkali is washed out, re-crystallisation takes place, but to a smaller extent than in the original fibre.

Certain other processes now being investigated involve chemical modification of the cellulose. One of these processes, first introduced in 1927, is *acetylation*, in which the hydroxyl groups are replaced by acetate groups. This change occurs only in the non-crystalline regions; the crystalline part is inaccessible to the reaction. The acetate groups are inert, so that less water is absorbed by acetylated cotton. Consequently its electrical resistance is higher, and so it is better for the purposes of electrical insulation. Cotton treated in this way is marketed under the name *Cotopa*. Acetylation also improves the rot resistance of cotton, and a similar improvement is found after treatment with acrylonitrile. Other chemical modifications of the cellulose confer other special properties. For example, oxidation with nitrogen dioxide makes cotton soluble, so that it can be used for surgical dressings that dissolve in body fluids. In general, chemical modifications have been found to reduce the strength and toughness of cotton, although the flat-abrasion resistance usually improves. Their utility depends largely on the special qualities they impart.

Another way of modifying cotton is to cause a resin to polymerise within the open structure of the non-crystalline regions. This process was pioneered by Tootal Broadhurst Lee Co in the 1920's, but the methods have improved considerably and its use has increased enormously since 1955. The effect of the cross-linked resin structure within the fibre is to stabilise the configuration of the fibre: it provides a framework causing the fibre to spring back into the position in which it is set. This makes fabrics wrinkle resistant. And whereas the cross-links in the non-crystalline regions of cotton are broken on saturation with water, the resin structure is unaffected; consequently, on drying the fibres return to the same shape, and the material does not need ironing. The resin treatment brings to cotton the wash-wear advantages of the synthetic fibres. These fabrics have proved very popular; in fact, over a billion yards were produced in the U.S.A. in 1956. One limitation of the method is that pleats and creases cannot be satisfactorily set in cotton fabrics which have been given a wash-wear finish, but various methods of overcoming the difficulty are being investigated.

There are, of course, the conventional chemical treatments such as scouring, bleaching, and dyeing which modify cotton and these finishing processes are continually being extended. For example, the deposition of chemicals on cotton is being used to impart flame resistance. A survey of the important ways of treating cotton is given in Table 4. Although these processes may be carried out on yarns or fabrics, they are in fact ways of making new fibres from cotton.

Table 4. Chemical Modifications of Cotton

Type of process	Chief properties	Uses	Potential uses
Mercerisation (treatment with caustic soda)	Improved lustre and strength in yarns and fabrics	Linings, apparel and household goods	
Resin treatments	Wrinkle-resistance; wash-wear; resilience; rot resistance	Apparel and household goods	
Acetylation (partial or complete)	Rot and heat resistance; high electrical resistance	Ironing board covers; dye resist yarns; electrical insulation	Awnings; tarpaulins; irrigation pipes
Oxidation of etherified cotton	Soluble in alkali	As scaffolding threads in fine fabrics	
Oxidation by nitrogen dioxide	Water soluble	Surgical dressings	
THPC-treatment (Proban)	Flame resistance	Apparel and household goods	Awnings tents; tarpaulins
BAP-treatment			
Lead chromate treatment	Improved weather resistance	Shade cloth for tobacco	
Various	Water repellency	Rain-wear	

Uses of Cotton

Cotton is a remarkably versatile fibre. Its uses are constantly expanding. A complete account of them would fill many pages and, in America, the National Cotton Council have for many years made detailed studies of the amount of cotton consumed in the major end-uses. Their figures for 1957, shown in Table 5, will illustrate the range of application of cotton textiles. To some extent, the figures reflect the American way of life—e.g., the high percentage of cotton trousers—but they will mostly apply more widely. From this information it is clear that cotton still retains the whole of some markets and while in others it holds a smaller share.

Future of Cotton

During the 200 years since the beginning of the industrial revolution, as populations have grown and higher standards of living have become a necessity, cotton has been the chief means of clothing the people, in addition to meeting and satisfying a host of industrial needs. What then is its future in a world where it has to contend with steady competition from new man-made fibres? So far, although man-made fibres are providing an increasing proportion of all fibres used, the total usage is increasing at such a rate that the actual amount of cotton used is not diminishing and the indications are that this is likely to continue for many years. More serious competition may arise, however, in the distant future. Of two possible types of threat to

Table 5. End-Uses of Cotton in U.S.A. in 1957

Figures or numbers of 500-lb. bales used, with cotton's percentage of total textile consumption added in brackets

ALL-USES TOTAL: 7,875,300 (45%)

	APPAREL Total: 3,912,800 (60%)			HOUSEHOLD Total: 2,308,500 (50%)		INDUSTRIAL Total: 1,654,000 (26%)	
	Men and boys	Women and Girls	Infants and Children				
Totals:	2,281,900 (72%)	1,040,100 (41%)	590,800 (76%)	Bedspreads	158,290 (93%)	Abrasives	31,520 (40%)
Bathing suits	15,050 (57%)	10,870 (49%)	5,990 (62%)	Bed ticking	70,150 (80%)	Awnings	52,190 (95%)
Bathrobes	11,040 (43%)	17,970 (67%)	7,710 (77%)	Blankets	72,850 (34%)	Baby carriages	940 (80%)
Coats, jackets, and leggings	108,690 (32%)	18,840 (8%)	14,540 (19%)	Curtains	39,040 (26%)	Bags	154,690 (12%)
Diapers	—	—	66,030 (100%)	Laces	17,230 (78%)	Bookbindings	29,850 (100%)
Dresses	—	326,500 (53%)	96,160 (84%)	Mattress felts	5,850 (1%)	Car seats and linings	133,950 (36%)
Gloves	86,200 (79%)	6,420 (57%)	150 (15%)	Mattress covers	8,480 (95%)	Car tops	9,900 (96%)
Foundation Garments	—	50,190 (54%)	—	Oilcloth	9,620 (100%)	Cheese coverings	1,600 (65%)
Handkerchiefs	18,170 (95%)	3,040 (86%)	—	Pillow cases	78,840 (100%)	Coffins	8,820 (52%)
Hosiery	107,780 (68%)	21,170 (9%)	16,240 (80%)	Quilts	6,420 (20%)	Cordage and twine	89,080 (11%)
Housecoats	—	9,340 (60%)	—	Quilted pads	15,670 (95%)	Electrical insulation	84,580 (23%)
Negligees	—	1,250 (27%)	—	Retail piece goods	311,380 (66%)	Filter cloth	10,200 (75%)
Nightwear	74,830 (96%)	64,920 (52%)	61,610 (98%)	Rugs and carpets	207,280 (18%)	Fishing supplies	17,510 (72%)
Overalls	128,520 (99%)	420 (99%)	68,250 (97%)	Sheets	455,820 (100%)	Flags	4,480 (80%)
Rainwear	20,160 (66%)	9,520 (26%)	3,730 (41%)	Slip covers	23,510 (70%)	Friction tape	10,690 (80%)
Shirts and blouses	621,040 (88%)	116,890 (71%)	12,300 (74%)	Stamped art (embroidery)	5,590 (89%)	Hose	53,540 (54%)
Suits and skirts	16,600 (8%)	69,840 (34%)	17,850 (54%)	Table cloths and napkins	42,720 (81%)	Laundry equipment	68,100 (44%)
Sweaters	4,980 (9%)	8,110 (5%)	4,100 (12%)	Thread	43,660 (99%)	Luggage	18,540 (24%)
Trousers	688,040 (78%)	—	—	Towels	366,220 (94%)	Machinery belts	91,630 (71%)
Underwear	334,640 (97%)	61,120 (20%)	49,640 (66%)	Upholstery	349,040 (60%)	Mail bags	5,540 (100%)
Washable service wear	46,150 (96%)	54,740 (70%)	—	Window shades	19,820 (58%)	Meat stockinettes	21,170 (100%)
						Medical supplies	105,610 (93%)
						Office ribbons	1,760 (75%)
						Paper felts	8,340 (34%)
						Pick sacks	11,090 (100%)
						Saturated woven fabric	7,060 (83%)
						Shoes	162,830 (32%)
						Sportsgear	4,590 (78%)
						Tarpaulins	62,700 (85%)
						Tents	55,140 (100%)
						Thread	157,750 (93%)
						Tobacco cloth	11,790 (100%)
						Tracing cloth	2,600 (95%)
						Tyres	114,080 (7%)
						Umbrellas	1,520 (44%)
						Vacuum cleaner bags	570 (30%)
						Venetian blind tape	4,760 (65%)
						Wiping cloth	24,950 (90%)
						Woven labels	650 (35%)
						Zipper tape	17,710 (97%)

From "Cotton Counts its Customers" (Preliminary 1957)—issued by National Cotton Council, October 1958.

cotton, the first would come from some new synthetic polymer which could be turned into good fibres, cheaper than cotton. This seems very unlikely unless the situation arises where world demands for food make it impossible or unprofitable to use land to grow fibres, or alternatively the increasing developments in nuclear fuel makes available large surpluses of petroleum and coal. The second possibility is that it might prove more economical to produce cellulose in some other form, such as trees or straw, and turn it into regenerated fibres, like rayon, but this again assumes that the land is still available for these purposes; it also does not take into account the increasing consumption of grasses, straws and trees in the paper making and allied industries.

Cotton's position in competition with other fibres could be weakened if its price was subject to wide fluctuations—a danger to which any natural fibre is subject, because of the vagaries of climate, pests, disease, and the size of crops. The effects would be particularly serious because cotton purchases lost during a period of high price might not be entirely regained when the price fell again. Other fibres with more stable prices might have captured the markets, but these are not immune to price changes reflected by differences in costs of raw materials, labour and other factors. Cotton's power to resist these threats rests on its combination of excellent properties, low price, and popularity as a textile raw material. Publicity is essential to maintain this popularity, but it is being provided by the many cotton growing organisations keenly aware of the present situation. Fundamentally, cotton never quite remains the same basic commodity. Its properties are constantly being improved. Plant breeders introduce better varieties and chemists are modifying the fibre to impart new features. Textile technologists are similarly making advances in processing and as long as farmers, merchants, spinners, scientists and technologists take this pride in it the future for cotton seems safe.

* * *

For Further Reference.

H. B. Brown and J. O. Ware, Cotton, McGraw Hill.
C. H. Fisher and F. S. Perkerson, Chemical Modification of Cotton, Tex. Res. J., 1958, 28, 769.

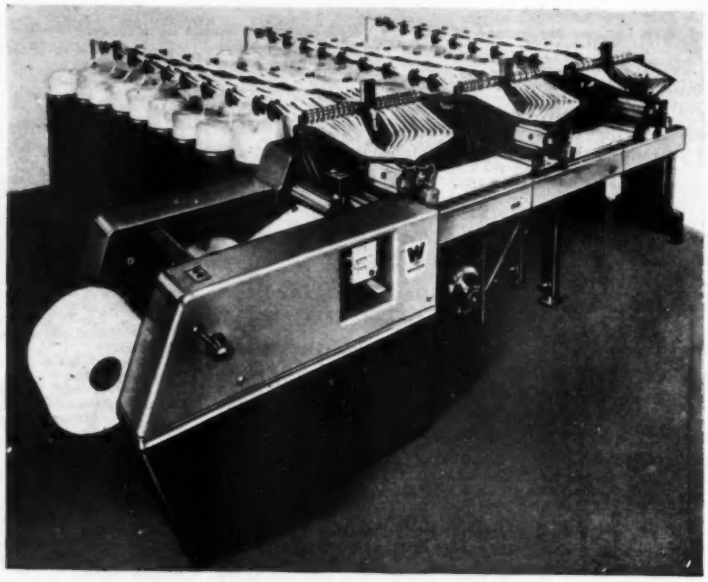
Fibres Dyed with Indigo Dyestuffs

Animal and vegetable fibres, dyed with indigo dyestuffs, particularly indigo and "reng," or their mixtures with 2-hydroxy-1 : 4-naphthoquinone, e.g. henna, are decolourised by first treating the fibres with an alkaline reducing composition, preferably a sodium dithionite solution having a pH of 11, and then with an alkaline solution containing bivalent and/or trivalent alcohols such as glycerol. The alcohol solution preferably also contains formamide which prevents re-oxidation of the dyestuff. (German Pat. Appln. 1,033,375.)

* * *

Bleach Employing Glycerine

Textile materials may be bleached in an aqueous solution (0·5 - 25 g./l.) of an alkali-metal chlorite in which is dissolved 0·1 - 20 g./l. of ethyl acetate, lactate, tartrate or phthalate, and a formate or an acetate of glycerol. The initial pH of the solution is between 8 and 6; temperatures of 40° - 150°C. are employed. In the absence of acids or acid-yielding substances chlorine dioxide is not evolved into the atmosphere. (U.S. Pat. 2,842,422.)



The new machine feeds 60 slivers and is said to increase comber production up to 25%

New "Super Lap" Reduces Comber Waste

A NEW "Super Lap" preparation method announced by Whitin Machine Works is reported to reduce comber waste 3% and increases comber production. According to Whitin engineers, this amount of saving will permit the installation to pay for itself in approximately one year in an average textile mill. The new method includes utilisation of the Even Draft drawframe and a new Super Lap machine. This newly designed machine, producing comber laps from drawing sliver, was especially developed to serve as the second unit in Super Lap preparation. Freeing the comber from straightening and parallelising, the new lap preparation method simplifies the comber's function of removing short fibres and neps. Moreover, the heavier laps prepared by the new method are claimed to be the optimum weight for maximum comber efficiency. The assigned task of Super Lap preparation is drafting and doubling sliver, straightening and parallelising, removal of fibre hooks and preparation of the lap.

Super Lap preparation consists of two machines, since two draftings are required —one in each direction—to remove both leading and trailing hooks. Whitin's high-speed Even Draft drawframe is ideally suited for the first operation and the new Super Lap machine is specifically designed for the second draft in the reverse direction. The combination produces up to four times larger total draft in both directions, four times the doubling and twice the production than older methods of lap preparation. Additionally, it permits greatly increased comber production from the use of a heavier lap, improved nep removal and noil reduction.

Using a can creel, 60 slivers are fed into the Super Lap, 20 each in three heads. The ends pass downward through a special two-over-three drafting system and along a table where the output of the three heads are combined into one lap. Combined sheets, 11¾ ins. wide, are drawn through the calendar rolls and wound into lap form. The lap is automatically ejected on to a receiving tray when it reaches the required size. Slivers are supported in their passage by a creel with individual supports equipped with electric stop motions to detect breaks. Other stop motions are provided at the top rollers and the calendar section.

Drafting System

After lengthy experiment, the two-over-three drafting system was adopted to secure optimum results in drafting the large fibre mass involved—up to approximately 4,200 gr. for a 1,000 gr./yd. lap. Large rollers, mounted in anti-friction bearings, secure the fibres firmly and operate at high speeds without heating or bending. Total weighting on each line of rolls is 250 lbs. supplied by pre-calibrated springs mounted in top arms over each end of the top rolls. A convenient handle permits easy weighting removal. Super Lap production is approximately 500 lbs./hr. Laboratory analysis of fibre arrangement prepared by the Super Lap preparation method shows, it is stated, that the fibres are parallel and that leading and trailing hooks have been removed.

New Publications

BRASS EYELETS AND WASHERS (B.S. 3102 : 1959). British Standards Institution, 2 Park Street, London, W.1 (price 7s 6d.).

Brass eyelets and washers are used extensively on tentage and miscellaneous textiles, leather, rubber and plastics goods and this new publication specifies the materials, quality and finish of eyelets and washers, together with full dimensions (inch and metric) of each components. Thirty illustrations show the classes and types of eyelets and washers and sets out clearly the designs and toleranced dimensions; drawings and tables giving the thicknesses of material gripped between eyelet and washer when the eyelet has been closed. An innovation is the notation system for eyelets and washers in which B.S. reference numbers are allotted to each size and type, e.g. "4A/10" denotes Type 4A, oblong eyelet with round ends, having a width of head of 1 $\frac{1}{32}$ ins. and an overall length of 2 $\frac{13}{32}$ ins.

* * *

STOKERS' MANUAL. National Industrial Fuel Efficiency Service, 71 Grosvenor Street, London, N.1 (price 2s. 6d net.).

First published in 1945, this important book has never been more valuable than it is now. Completely revised, it covers new developments in the mechanical firing of shell boilers with coal and now includes a section on oil firing. Hand-fired boilers, grates and firebars, air supply and control, coal properties, boiler performance, safety factors, etc., are dealt with in an admirable manner.

Modern Cotton Dress Prints

Featuring a rose or similar flower as their design theme, the patterns reproduced on the facing page are a selection from the ranges manufactured by Edmund Potter and Co. Ltd., 89 Oxford Street, Manchester 1. Needless to say, these cloths are all Lancashire made, and brief details are as follows:—

(1) Inglesheen. A Calpreta permanent sheen finish. The lovely floral design is available in several different but equally attractive colour-ways.

(2) Inglista. Another delightful Calpreta "Carefree" cotton finish. It is a "drip-dry" fabric requiring little or no ironing. Available in five colour-ways, the rose design is on a novel black and white ground.

(3) Inglesheen. Another fine example of this Calpreta cotton fabric, available in five colour-ways, in fast colours.

(4) Top of the Form. Cotton plain with Calpreta "drip-dry" sheen finish, combining the qualities of carefree and sheen. The design is available on black, blue, green and grey backgrounds.

(5) Another Inglista "no-iron" cotton available in four different colour-ways.

(6) Inglesheen. In different colour combinations, this neat design is finely balanced by the tonal ranges selected.

(7) Auriole. Cotton sateen with a Calpreta permanent sheen finish. Four-colour combinations—pink, blue, green and gold—are available.

(8) Auriole. Light blue and light green are the two grounds selected for this pleasant, fast colour, print.

Textile Institute Conference

The theme of the Institute's annual conference at Scarborough was "Machinery for Textiles : the Demands of the Industry." The subject is extremely important, particularly in view of the redundancy and re-equipment problem in Lancashire. Abstracts from two of the papers are given on this and succeeding pages and others will appear in the July issue

Recent Progress in Cotton Spinning Technology

By W. NUTTER, B.SC.(TECH.) and W. SLATER†

DURING the past 15 years, economic considerations have enforced technological development, and there is no doubt that a modern spinning plant is much more productive than a pre-war one; it is, therefore, with developments in the post-war period that we have been concerned. A considerable increase in operating speeds has been achieved, particularly on drawframes, combers and ring frames, and these, together with higher drafts, have effectively increased overall mill productivity as well as labour productivity. Large packages are also advocated as an effective method of increasing operative productivity, but other economic factors are important, and it can be shown that the extra requirements of space, power and higher capital charges impose an economic limit to package size.

The ultimate in conventional spinning probably will be sliver-to-yarn spinning. Several methods, all necessitating very high drafts, are now being marketed with varying degrees of success, but as yet, their technological acceptance and economic soundness are subjects of debate.

Short-Cut Processing

This evolution in cotton spinning has been taking place gradually during the past 30 years. Higher drafts at the ring frame resulted in coarser roving hanks from fewer machines, and in the late 1930s the introduction of the high-draft speed frame enabled one or two passages to be used instead of three or four. During the past few years, it has become common practice in some mills to spin up to 60s count from single roving and only one passage of speed frame, and considerable progress has been made in the technique of spinning direct from sliver. These developments are due largely to improved sliver regularity and new drafting systems, but there must be some limit to the shortening of the spinning process if conventional methods are used. For carded quality yarns, this limit is set by fibre arrangement in the sliver.

Speed Frame Drafting.—Normally associated with a draft range of 10 to 25, the success of high drafting at the speed frame depends upon adequate sliver constriction within and between drafting zones and upon the means of fibre control. When a large bulk of fibres is processed, aprons do not effectively control fibre movement and they are used only in the front zone of a two-zone system unless very light slivers are creeled.

Developments at the drawframe and in ring frame drafting are rapidly making present conceptions of the high-draft speed frame obsolete. With very regular drawframe slivers, it is possible to spin fine counts from single roving, providing the winding mechanism at the speed frame is correctly set, and, if ring frame drafts up to 40 are possible with the new systems, then relatively coarse hanks are required from the speed frame. Counts up to 40s can be spun from drawframe slivers of normal weight with speed frame drafts which need not exceed 8, and, if finer counts are required, bi-coiling can be used at the finisher head of drawing to produce a light-weight sliver. High-draft speed frame drafting systems of the two-zone roller and apron types do not operate efficiently under these conditions. Experiments at the drawframe show there is an optimum amount of draft for any drafting assembly according to cotton quality. For a simple system consisting of two pairs of rollers, the optimum range normally lies between 3 and 8 for pre-drawn parallel fibres and, within this range, the most serious deterioration is likely to occur if very low drafts are used. This may arise, in part, from difficulty in establishing the correct roller setting for a low draft.

If very low drafts are required in a 4-line two-zone speed frame system, these adverse conditions can be avoided by departing from the convention of equal draft distribution between the two zones and inserting practically all the draft in one zone. This is a compromise only, and the real solution is to use a system designed for the low-draft range such as the British Rayon Research Association (B.R.R.A.) arrangement for rayon and synthetic fibres. Speed frame drafting developments which, in the past, have been allied to the ring frame are now more closely associated with the drawframe.

Ring Frame Drafting.—Short-cut processing depends upon high drafting at the spinning machine and began when the Casablancas double-apron system began to supersede the 3-line roller arrangement as a practical drafting system almost 40 years ago. During the past 30 years, very many roller and apron combinations have been developed, although the bases of all subsequent systems were the original 3-line roller, single-apron and double-apron arrangements. From the 3-line roller system have evolved the 4-line and Balmes systems. The Shaw and some top-apron systems

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have developed from the original single-apron, and double-apron drafting is now available in the latest Casablancas and S.K.F. arrangements. Very high drafts are possible with the new apron systems which are based on 3 lines of bottom rollers and which rely on a high degree of fibre control in the front drafting zone. Drafts of 30 or more can be inserted in the apron zone and, with such a high draft in one zone, it is vitally important that the top and bottom front rollers should be manufactured to very close limits of concentricity.

The requirements of a ring frame drafting system are quite different from those of the preceding machines in the spinning process, and even the early spinners acknowledged this by using 4 lines of rollers up to the intermediate frame and 3 lines at the roving and spinning frames, presumably because of reduced fibre bulk. It has been proposed that different roller arrangements should be used at the drawframe according to the condition of the slivers, and it is a common practice on flyer frames to use aprons only when relatively light slivers are creeled. The handling of fibre bulk is not a problem at the ring frame when rovings are creeled, and the important feature of the drafting system must be fibre control. This is the only machine in the cotton spinning range where complication in the drafting system is at all justified, and, among existing systems, various arrangements of double apron are probably the most efficient.

Spinning Direct from Sliver

Sliver-to-yarn spinning is still in its early stages of development, although several machines are on the market, some of which are claimed to give drafts up to 600. The first frames to be produced commercially about 10 years ago were single-sided, but, since that time, considerable progress has been made in overcoming the creeling problem so that conventional double-sided ring frames can be used. Consolidation by false twist or rubbing aprons is now widely used at the finisher head of drawing before winding the sliver into balls.

Drafting from sliver has been approached in many ways by different machinery makers. The Nastrofil system consists of up to 7 lines of drafting rollers with a very low draft in each zone and with no method of fibre control other than constrictors. Pfenningsberg use a 4-line arrangement with a graduated draft distribution in three zones. Fibre control is introduced by a top-apron assembly over the 2nd- and 3rd-line large-diameter bottom fluted rollers. The Japanese have been active in this field and have produced several systems usually based on two or more drafting zones separated by a constricting zone. A two-zone double-apron system is used on the Tweedales and Smalley sliver-to-yarn ring frame.

The fundamental problems of drafting from sliver are a combination of those associated with conventional speed frames and ring frames. It is important to balance the drafts according to the available drafting elements and, if a simple roller system is used in the first zone, then the draft inserted should be between 3 and 8. This should be followed by a neutral zone to allow for fibre constriction before the main draft is inserted between aprons or other means of fibre control. In conventional spinning practice, several cardroom reversals take place which are often considered to enhance yarn quality, and there may be some doubt about the validity of passing a sliver in one direction through a series of drafting zones. This question is one of fibre arrangement.

Since the early 1950s, considerable technical advance has been made with the modern speed-frame system in the form of larger packages and higher spindle speeds, and these developments, coupled with higher drafts at the ring frame, clearly reduce the potential savings available to sliver-to-yarn spinning. Features such as spinning from coarse speed-frame rovings should, however, eventually help to ensure a smoother transition to true direct spinning.

Effect of Fibre Arrangement

Fig. 1 shows the result of an experiment at Helmshore to examine the effect of hooked fibres on yarn strength. Yarn spun direct from fine-hank card sliver with no pre-ring frame draft proved to be very sensitive to direction of presentation and, with leading hooks passing through the ring frame system, a 50% lower strength was recorded compared with reverse drafting. As the pre-ring frame draft was increased first by creeling card sliver to a speed frame and then by the introduction of drawframes, the effect of hooked fibre ends became less marked owing to the parallelising effect of drafting, but, with conventional processing, the effect could be seen with a pre-ring frame draft exceeding 1,000. Spinning direct from normal-weight card sliver proved to be impossible, but Fig. 1 shows how yarn quality was affected by draft and direction in sliver-to-yarn spinning.

The results of those experiments show quite clearly that fibre arrangement must be a major limiting factor in any subsequent shortening of the spinning process.

The introduction of artificial reversals makes an interesting study for conventional and sliver-to-yarn spinning. If it can be assumed that a pre-ring frame draft of 30 gives adequate fibre parallelisation, and this is indicated from the results given in Fig. 1, then two intermediate machines to give this draft could be used to prepare the fibres for ring frame drafting. An alternative is to avoid reversals by combining two cardroom operations such as double drawing in one machine, and it is this approach which is most likely to be successful if the ultimate in short processing by conventional cardroom machines is to be achieved. This progressive shortening and linking together of existing processes must be accompanied by some means of automatic control of weight per unit length and, whilst such a mechanism has been a standard feature of the scutcher for the past 80 years, it has never been sufficiently

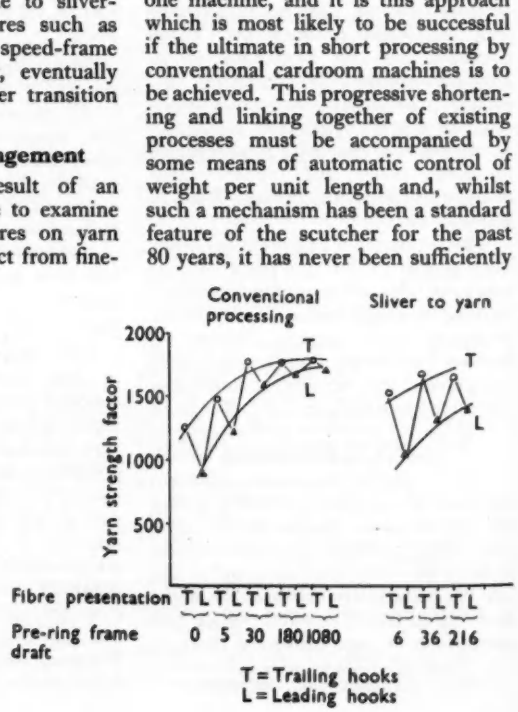

Fig. 1. Effect of pre-ringframe draft and fibre arrangement on yarn strength

well understood for its value to be appreciated. Modern thoughts on auto-levelling are directed towards some later stage of processing where the application is likely to be more difficult and more expensive.

Ring Spinning

Post-war trends in processing techniques and in machine design have affected the level of front-roller delivery which is acceptable in mill practice. For example, the trend towards automatic weaving has led to a greater demand for yarns which have been carefully cleared during one or more winding processes in order to ensure high weaving efficiencies. In such a situation, a knot may, for certain end uses, be more acceptable than a piecing; therefore, a high front-roller speed may be permissible if the resultant bulkier piecings are subsequently removed by clearer winding on modern high-speed machinery. Further, the application of top-arm weighting and the introduction of a longer lappet movement and new spinning angles to even out spinning tensions have all facilitated piecing-up.

The problem of front-roller speed is, of course, most acute when low-twist coarse yarns are being spun, but our experience is that, in a modern plant, it is only rarely that production rate is limited by actual piecing-up considerations. Study usually shows that the true limitation is associated with lashings of adjacent ends after end breaks, roller laps, fly liberation at the front roller nip, etc. Concurrently with the development of large spun packages there was active investigation into the physical and economic limitations to spindle speed. These researches resulted in the development of new ring sections and traveller shapes and, as a result, traveller velocities much higher than the formerly accepted 70 ft. per sec. are now being obtained in mill practice.

Spin Plans

Two spin plans have been prepared (Table 1) in order to illustrate the degree of technological advancement achieved in recent years. We believe that plan No. 1 fairly represents a reasonably modern existing mill in the immediate post-war years. Spin plan No. 2 is representative of an up-to-date plant. Some reservations must be made in presenting spin plan No. 2, since it must be emphasised that the requirements for each mill require individual assessment; for example, raw material, end product and versatility are factors which must be taken into account.

It would be unrealistic to attempt to give a detailed estimate of the monetary saving which a complete modern mill would achieve in comparison with one example of a traditional mill in a paper of this nature; for, obviously, existing mills vary considerably, also they can be modernised in different degrees according to circumstances. Further, when considering re-equipment, it is often necessary to balance the potential increases in labour productivity against particular levels of capital expenditure, and it is also essential that account should be taken of the possible effects on yarn quality or raw material costs.

Examination of the spin plans shows that the modern spinning frame specified in Plan 2 would offer higher speed and a larger spun package; in consequence, fewer spindles would be required and the cost of labour for doffing at the ring frame and creeling at the winder would be reduced. Pneumatic under-clearers, applied as an integral part of the ring frame design, and overhead blowers would be specified in order to minimise cleaning work. Naturally, the larger spun package would demand a wider pitch of spindles and this would result in fewer spindles per machine. However, in this example, the higher spindle speed of the modern frame would offset its larger space requirements, therefore, there would be no overall increase in the space occupied by the spinning frame.

It is clear that higher drafting at the ring frame and speed frame would achieve major economies in the roving section of the cardroom, since 8×126 high-draft speed frames (1,008 spindles) would replace a total of 5,344 slubber, intermediate and rover spindles. In lap preparation, the use of a different method utilising machines operating at higher speeds whilst producing heavier-weight-per-yard laps would result in substantial labour saving; further savings would also accrue from installing the recently developed high-production combers.

The Future

There will probably be a trend in the future towards a significant reduction in labour costs at the expense of greater machinery costs for individual units. However, if new designs facilitate substantially continuous machine utilisation, the net result could well be a reduction in overall machinery costs. Research directed towards complete automation in one step would be a highly speculative venture; for, if we accept the purest interpretation of the word automation, then it is by radical re-thinking of the methods of producing yarns that the biggest reduction in labour requirements can be made. However, although radical new designs might offer exciting possibilities, where the potential gains are greatest, the chances of successful early exploitation are most problematical. Fortunately, there is an alternative approach which, while not likely to give spectacular results, could lead to a further major advance in the technology of spinning. In this second line of approach, the processes of opening, carding, drawing and spinning would largely be accepted as basic requirements, but the actual machines would be altered and the flow of material modified by linkage of the processes; auto-levelling and sliver-to-yarn spinning would be incorporated. Such a sequence of machinery would not achieve a break through in spinning technology, since it would be based on existing techniques, but it could reduce labour requirements to a level which would allow round-the-clock working of the machinery whilst minimising the social problems inherent in this type of operating. Thus, better use would be made of buildings, plant, capital, etc., and the increase in labour productivity would be achieved without making in-roads into any of the nation's other vital resources. Power consumption, for example, should not be greatly affected, nor would there be any need for substantial numbers of technicians with special skills.

Table 1. Spin Plans for a Production of 530 lb./hr. of 50s Combed Yarn (11·8 tex)

PLAN NO. 1			PLAN No. 2		
Machines	Hank	Speed	Machines	Hank	Speed
90 Cards	0·15	7½ r.p.m.	90 Cards	0·15	7½ r.p.m.
6 Silver lap	22 dwt.	110 ft./min.	1×20 D.F. del.	0·14	300 ft./min.
6 Ribbon lap	22 dwt.	110 ft./min.	2 Lap formers	40 dwt.	160 ft./min.
40 N. Combers	0·18	90 n./min. 0·27-in. feed	17 High-prod. c.	0·14	116 n./min. 0·27-in. feed
3×48 D.F. del.	0·18	120 ft./min.	2×24 D.F. del.	0·14	200 ft./min.
4×90 Slubbers	0·8	650 r.p.m.	—	—	—
8×150 Inters	2·0	750 r.p.m.	8×126 H.D. Inters	1·8	800 r.p.m.
22×180 Rovers	5·5	1,100 r.p.m.	—	—	—
94×480 Rings 6-in. lift, 1¼-in. rings	50s D.R.	8,500 r.p.m.	95×400 Rings 9-in. lift, 2-in. rings	50s S.R.	10,000 r.p.m.

Textile Institute Conference

New Card Room Equipment—and a Plan for the Future

By R. A. RUSCA, B.SC.†

THE U.S. Department of Agriculture conducts an extensive research programme which includes work on cotton breeding, producing, ginning, textile processing and marketing. The Department's machinery development research has been centred at the Southern Regional Research Laboratory in New Orleans since 1941. The most recent effort of this group has been on developing new equipment for cleaning and carding cotton in textile mills. The SRRL blowing-room line embodies a bale breaker-blender that automatically blends cotton from up to 40 bales, an opener-cleaner with a cleaning efficiency of about 35% at 1,500 lbs. per hour production, and a finisher-scutcher that removes 50% of the remaining trash at 400 lbs. per hour production.

Because the opener-cleaner is now being manufactured in England and other countries as well as in the U.S., brief mention of the results being achieved with the machine may be of interest. Essentially, the opener-cleaner is the well-known SRRL opener with built-in cleaning mechanisms. The cleaner retains the opening and blending ability of the opener, and at the same time, subjects the cotton to cleaning actions while the cotton is in a very open condition. Evaluations of the opener-cleaner under pilot-scale conditions indicate that it removes an average of about one-third of the trash in cotton, depending upon the type of cotton and trash, at a production rate of 1,600 lbs. per hour. Laboratory and mill evaluations show that the opener-cleaner does not damage cotton up to 1¼ ins. classer's length.

The SRRL Flatless Card

Concurrent with the development of improved cleaning equipment, researchers at the Southern Regional Research Laboratory were concerned with the next step in cotton textile processing—the card. Several years ago, a study of carding aerodynamics was undertaken in an attempt to determine the exact function of air in carding. Studies of card engine aerodynamics led to the conclusions that:—

(1) Excessive air pressure under the taker-in cover contributes to the loss of spinnable fibre and reduces the efficiency of trash removal in the mote box.
(2) Air currents play a minor role in fibre separation in the carding area, and
(3) Individualising fibres can be accomplished by a suitable resistant force other than conventional flats.

The SRRL granular card is an apparatus for converting standard flat top cards to carding without flats. The apparatus replaces the flat assembly and flexible bends. Essentially, it is comprised of an air-tight cover with an aluminium-oxide carding surface closely spaced to the main cylinder, and a small metallic-wire-clothed roll installed in conjunction with the taker-in to pre-open the fibre tufts thoroughly before carding. Although not required for carding without flats, the use of a modified taker-in cover that has been developed to improve cleaning at the mote knives is recommended.

The general design is depicted in Fig. 1. The lap A is fed under the new type taker-in cover B to the taker-in C which deposits the fibres on main cylinder D in the conventional manner. Large tufts or groups of fibres are removed from the cylinder by pre-opener roll E which returns these tufts to the taker-in for reprocessing. The fibres on the cylinder D are subjected to a carding action by a special granular surface on the underside of a stationary cover F. This surface is indicated at G. Doffing is accomplished by the usual doffer H and comb.

The SRRL card substitutes sharp-pointed granules for conventional flat wires. The material used is a dimensionally stable, tightly-woven cotton fabric coated on one side with aluminium-oxide granules of a specific size and oriented at a specific angle to provide maximum power for separating fibres, and coated on the other side with a pressure-sensitive adhesive that will adhere firmly to a metal surface and yet is easily removed for replacement. The height of the granules does not exceed a few thousandths of an inch, so that no fibre loading can occur and hence no flat strips are produced.

The granular material, developed by Minnesota Mining and Manufacturing Co., is available in sheets cut to fit the card. Life of the material depends upon carding rates, type of cotton, amount of dust in the cotton and similar factors. Mill tests in the U.S. indicate 3 to 6 months' service on the basis of an 80-hour week. Processing strict middling grade cotton, one unit operated 6 months on a three-shift basis without replacement.

The granular surface is bonded to four aluminium castings that form an air-tight seal on the top of the card.

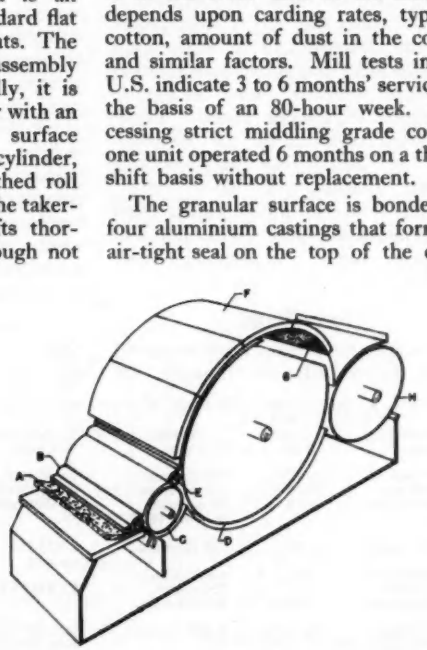

Fig. 1. The SRRL card which has a special granular surface on the underside of the stationary cover F

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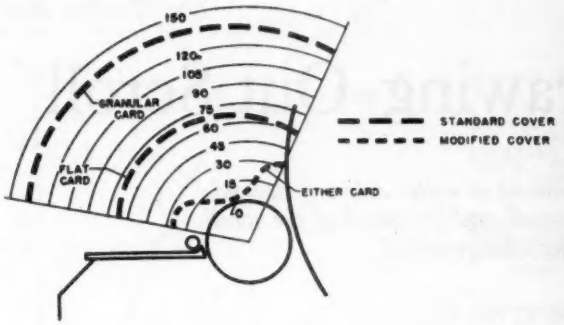


Fig. 2. Pressure in thousands of an inch in water

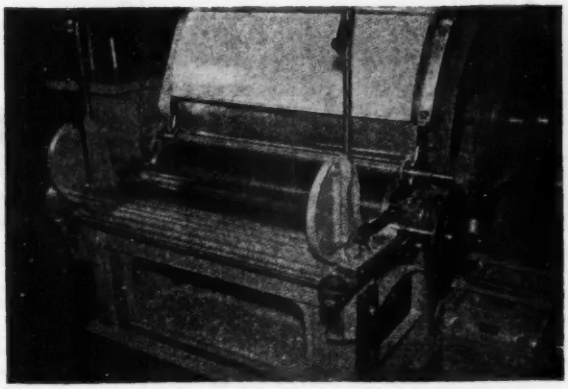


Fig. 3. Granular card with taker-in cover removed to show the pre-opener roll

The inner surfaces are machined to very close tolerances because it is essential that they be concentric to the main cylinder. After the initial installation and setting, the castings can be removed and replaced without the need for resetting.

The shallow, fine pointed granular surface does not have sufficient holding power to separate the fibres completely from heavy tufts of cotton which may result from plucking at the taker-in due to improper feed roll action or poor quality laps. The pre-opener roll combs out and removes these clumps of fibres from the main cylinder and returns them to the taker-in for further separation. This technique should be beneficial for standard flat cards as well as for the granular card.

A modified taker-in cover is recommended as part of the card conversion. The granular card apparatus, by sealing the top section of the card, causes an increase of air pressure under the taker-in cover which has an undesirable effect on taker-in cleaning efficiency. The new low-pressure cover allows air to escape through the lap and thus materially decreases pressure in the mote box (Fig. 2). The cover is closely contoured around the taker-in and extends over the feed roll, eliminating the scavenger roll. No changes are necessary in the mote box. Fig. 3 is a photograph of a granular card with the taker-in cover removed to reveal the pre-opener roll. The entire "conversion kit" weighs about 200 lbs., compared with about 1,000 lbs. for the flat assembly it replaces.

Results

The lack of flats on the granular card reduces overall cleaning efficiency by several per cent. To compensate for this, the low-pressure taker-in cover is used to improve cleaning and reduce fibre loss at the mote knives. As compared with a conventional cover, at standard taker-in speeds, the modified cover decreases fibre loss without increasing cleaning.

Four factors have been found to influence in varying degrees the performance of the granular card. The most important is the closeness of the setting of the granular surface to the main cylinder. Closer settings improve quality, with 0·010 in. being the maximum setting permissible and 0·005 in. producing the best quality sliver—especially in regard to nep count. Other operational variables are granule size, taker-in speed and pre-opener roll speed. Granule size has some effect on quality, with taker-in and pre-opener roll speeds being of lesser importance.

The granular card has been undergoing mill tests since August, 1958. Typical results are reproduced in Table I. The data show about 4% higher production, 10% less neps, approximately the same yarn strength and uniformity, and slightly lower yarn appearance for the granular card. Production rate was the same for both cards; mill tests have not confirmed laboratory findings that granular carding makes possible substantial increases in production rate.

The granular card appears to be a promising development, but much remains to be learned. Primary advantages are:—

(1) Eliminates all flats and flat waste, thus lowering card processing costs.

(2) Reduces dust and fly and improves cardroom working conditions.

(3) Reduces card weight by approximately 800 lbs.

(4) Requires $\frac{1}{8}$ h.p. less to drive the card.

(5) In general, product quality is not affected. Nep count and sliver uniformity are improved, yarn strength is slightly lower, yarn uniformity is unchanged.

Many U.S. mills are installing card conversions and, within the year, these trials should provide factual information over a wide range of operating conditions.

Table 1. Effect of Standard Card and SRRL Card on Waste and Quality in the Mill*

	Card Sliver† Neps per 100 ins.	Card Sliver Uniformity (Uster) Average Value %	Finisher Dwg. Uniformity (Uster) Average Value %	Roving Uniformity (Uster) Average Value %	Hank Roving Average Value %
Standard Card	10·3	2·9	3·8	7·5	2·03
SRRL Card	9·2	2·8	4·0	7·5	1·98

	Skein Strength‡	Single-strand Strength	Average Yarn Count	Strength Constant	Elongation %	Uniformity (Uster) Average Value % %	Yarn Appearance Grade
Standard Card	68 lbs.	0·51 lb.	30·3 (19·5 tex)	2,060	6·3	15·9	B+
SRRL Card	67 lbs.	0·48 lb.	31·6 (18·7 tex)	2,117	5·5	15·4	B

	Total Cotton Fed %	Stock Delivered %	Front Waste %	Cyl. & Doff Strips %	Motes %	Fly %	Scavenger %	Flat Strips %	Invisible Loss %	Total %
Standard Card	100	93·93	0·67	0·88	0·65	0·19	0·02	2·62	1·04	100·00
SRRL Card	100	97·98	0·53	0·57	0·52	0·63	—	—	—	100·23

* All data by courtesy of Avondale Mills.
† Nep counts were made for an average of four times per day for a period of 14 days.
‡ Yarn tests were made directly from cone—10 tests each for skein strength and weight, 150 tests for single-strand strength.

A Study of the Drawing-Out Scroll

The relationship of carriage movement to roller delivery depends on two factors (a) setting of the scroll and (b) speed of the scroll as governed by its change-wheel

By J. A. B. MITCHELL†

TO any one intently watching the woollen mule in operation probably the most fascinating feature is the smooth progressive reduction in speed of the carriage as it is driven out from under the roller beam. In this the woollen mule differs from its namesake employed in the worsted and cotton spinning sections of the industry. The typical scroll is more or less symmetrical, i.e. obverse and reverse faces have the spiral track for the rope passing between maximum and minimum diameters, in order to produce a simple harmonic motion to the carriage which it drives. In this manner the carriage is made to start away slowly, accelerate to reach top speed midway in the run and then slow down during the second half. This double scroll is the customary form employed to pull the carriage in to the rollers, but the drawing-out scroll of the woollen mule is designed to give rapid acceleration over the first 8 to 12 ins. while reaching the top speed which continues over the next 40 ins. or so of the journey, after which follows a gradual drop in the rate of carriage movement during the last 18 to 24 ins. of the normal 72 ins. stretch.

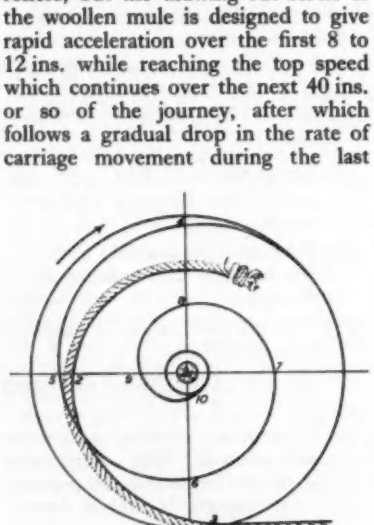


Fig. 1. Type of scroll usually employed for all wool yarns in the draft range 1·33 to 1·66

† *Scottish Woollen Technical College, Galashiels.*

Scroll Setting

A common type of drawing-out scroll for spinning all-wool yarns with drafts ranging from 1·33 to 1·66 is shown at Fig. 1. In effect the spiral track begins on the reverse side at the point 1 where the rope is attached by a crown knot and eye-bolt and merges with the main track on the obverse face at the point marked 3. From here the track keeps on the rim of the scroll to the point 4 and then descends gradually by stages marked 5 to 10 until it merges with the narrow part or "nose" (approx. 2½ ins. dia.) on which it continues for another revolution. Thus in roughly three revolutions of the shaft A the spiral track passes between the extremes of diameter which are 14 and 2½ ins.

A reserve length of rope is accommodated at the starting and finishing ends of the track so that changes can be made in the setting of the scroll in order to increase the duration of the high speed at the expense of the low speed and conversely. While ensuring the necessary slow start-up and finish to the outward movement of the carriage, the drawing-out scroll also plays a vital part in the drafting stage. Traditionally, the woollen thread is spun from twistless slubbing on the principle of "draft against concurrent twist." As draft proceeds over the last 20 ins. or so of the carriage traverse, the increasing length and diminishing thickness of the slubbing demand the insertion of an increasing amount of twist to ensure complete control of fibre movement throughout the entire drafting period.

In the evolution of the present-day mule from the "jenny" the necessary increase in drawing twist, as attenuation of the slubbing continues, could at first and until recently, only be obtained by combining a constant

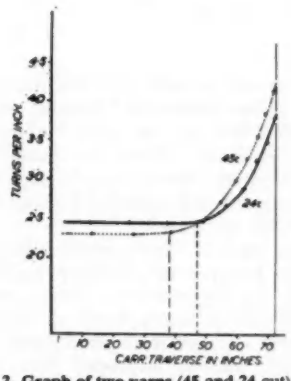
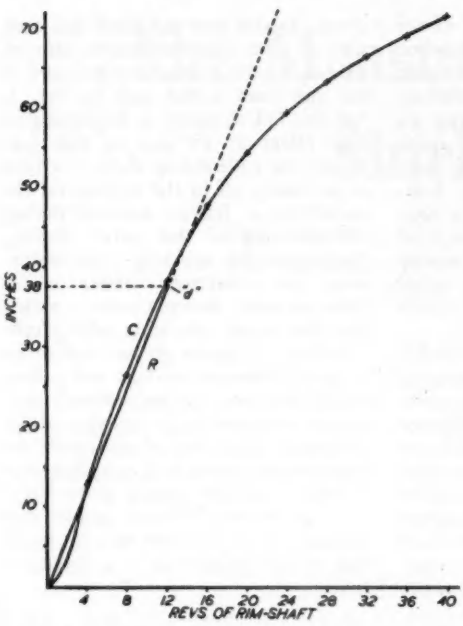


Fig. 2. Graph of two yarns (45 and 24 cut) spun on the same mule

spindle speed with a variable speed of carriage. Only in the last 20 years has it been possible to build woollen mules on the alternative plan, i.e. a differential speed for the spindle (through a variable-speed motor) working in conjunction with an almost constant speed of carriage. But the original idea of a variable speed of carriage is helpful in drafting as it causes the draft force to be applied at a diminishing rate with a caution which is quite uncanny. Obviously this is less important and necessary when spinning yarns at low draft, but in the high class trade where drafts of 1·5 and 1·6 are common this feature of the woollen mule is most beneficial in avoiding excessive end breakages. The decreasing rate at which the drafting tension is imposed is absent on all spinning frames which draw or attenuate the slubbing continuously during its passage through successive pairs of rollers running at stepped-up speeds.

By calculations, based on measurements taken at the mule, it is possible to arrive at the turns per inch of twist imposed on the slubbing at various stages on the outward run of the carriage. Fig. 2 shows graphs plotted from results obtained at different

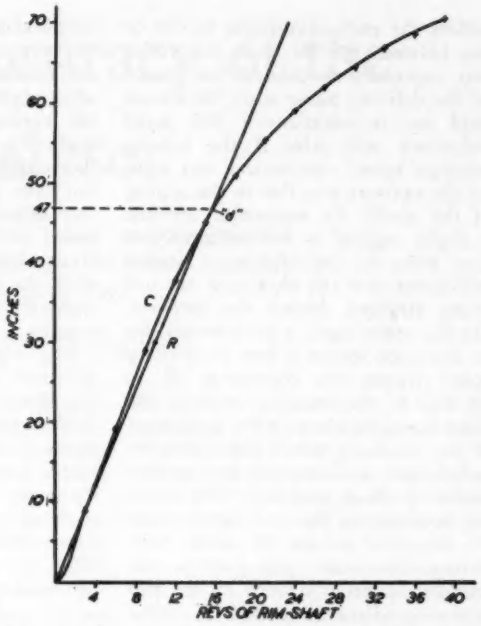


(left) Fig. 3. Delivery and drafting when spinning 45-cut Saxony with high draft

(right) Fig. 4. Conditions when spinning 32-cut Cheviot with lower draft

C = distance moved by carriage

R = length of slubbing delivered by rollers



times during the spinning of two yarns, one a 24 cut (19's Y.S.W.) warp yarn with a "draw" or delivery of 47 ins. on a mule stretch of 72 ins., the other a 45 cut (35's Y.S.W.) spun with a delivery of 38 ins. on the same mule, the full details being set out in Table 1.

TABLE 1

Yarn Count	Slubbing Delivered	Draft
24 cut Chev. (19 sk.)	47"	1·53
45 cut Sax. (35 sk.)	38"	1·9

In each case the twist remains practically constant at the lower level throughout the "delivery" period, after which the t.p.i. rise rapidly as the remainder of the run is covered, i.e. during the "drafting" stage. This increase in twist, necessary for reasons already mentioned, is the direct outcome of the slowing down of the carriage due to the shape and setting of the drawing-out scroll. Although the amount of draft differs appreciably in the two yarns it will be observed that the rise in t.p.i. in each case begins about the point of the run where the rollers stop, i.e. when "delivery" ends and "drafting" begins.

At the commencement of a new "draw" of the mule carriage the drafting rollers driven through the roller box commence to pay out slubbing to the revolving and receding spindle. This delivery period continues for approximately 66 to 75% of the carriage traverse, then the rollers stop and "drafting" begins. Thus the length of condenser slubbing presented to the spindle is drawn out, under control by twist, to the full extent of the carriage run. The nominal draft is basically C/S where C and S are the counts of thread and slubbing respectively. Hence, the length of slubbing to be delivered over a given "stretch" of carriage is proportional to C/S.

Altering Draft

The draft on the woollen mule is increased by shortening the delivery and decreased by lengthening it. Throughout the entire delivery period the rollers run at a steady speed and the rate at which the carriage moves during this time must be tuned to suit the flow of slubbing for approximately 46 to 55 ins. of the full stretch. The problem of harmonising a variable rate of carriage movement with a constant speed of rollers during this phase is a vital one, even although the length of slubbing paid out varies only a few inches on either side of a figure which is typical for the materials employed and for the customary draft in use.

The relationship of carriage movement to roller delivery depends on two factors:—

(1) Setting of the drawing-out scroll.
(2) Speed of the scroll as governed by its own change-wheel.

Minor alterations are made by moving the scroll forward or backward, whereas the change-wheel is only altered occasionally to supplement the scroll setting when extremes are encountered in the draft necessary for a yarn or in the composition of the blend. Unless the outward speed of the carriage is adjusted to be reasonably near to the surface speed of the rollers, then either of two contingencies may arise. In one instance if the carriage travels much faster than the rollers then during the first 8 or 10 ins. of the run-out the ends are liable to be subjected to an unbearable strain so that many break down or get drawn into "twits" or "points."

Later in the delivery period the presence of twist may save the ends from total collapse, but the excess speed of carriage over rollers may still endanger the chances of drafting the slubbings evenly. Fortunately a "safety valve" operates to minimise the danger of ends bursting as the carriage moves away from the rollers. This arises from the fact that the angle of incidence of thread with spindle is very high at this point, while the short length of thread between roller nip and spindle is often slack but fully twisted since it is really part of the spun yarn left unwound at the change-over from the winding to the spinning stage. Consequently the gain in carriage speed over rollers, unless excessive during the first few inches, seldom does the damage one would expect, because at the surge of the receding spindle the slack thread is easily pulled off the blade and twist already there saves the slubbing from complete collapse.

In the second case when the rate of the carriage movement is slightly less than the surface speed of the

rollers the ends may begin to dip or sag between spindle point and roller nip, especially on the last few inches of the delivery phase since the excess paid out is cumulative. The same behaviour will arise if the fall in carriage speed commences too soon on the outward run due to the setting of the scroll. In reasonable amount a slight sagging is not harmful and may even be regarded as a visible indication that the slubbings are not being strained during the pay-out. On the other hand, a pronounced dip in the ends means a loss of drafting space within the remaining 20 to 24 ins. of the traverse because the slack has to be taken up (by movement of the carriage) before the fibres are called upon to slide over one another under drafting tension. Where the sag is excessive, due to a combination of the two factors of speed and setting, the loose yarn gathers and swirls in disorderly loops on the top of the spindle until pulled off. This is not only unsightly but it is also a cause of bad distribution of twist, diminished draft and a possible source of snarls in the thread.

Relationship Between Carriage and Roller

Figs. 3 and 4 illustrate a working relationship between roller and carriage speed which had been established in the customary practical way when spinning the 45 cut (35's Y.S.W.) Saxony yarn already mentioned, and a 32 cut (25's Y.S.W.) Cheviot with normal draft. In each case the data were obtained by measurements and/or calculations at every three revolutions of the rim-shaft, which division corresponds to equal intervals of time. The rate of slubbing delivered from the rollers was calculated from the number of teeth in the wheels which transmit motion from the rim-shaft to the bottom roller of known diameter, while the progress of the carriage on its outward journey was measured as the distance from spindle to roller nip at every third revolution of the rim-shaft. It will be observed from both graphs that the carriage shows a slow start, due to having to overcome inertia, combined with the effect of the shape and setting of the scroll, but it soon picks up speed to overtake and then pass the surface speed of the rollers.

Fig. 3 represents the conditions established for delivery and drafting when spinning the 45 cut Saxony yarn with high draft. It will be seen that the carriage has drawn level with the roller speed after 10 ins. and then keeps ahead of it for the rest of the delivery period. At the point (marked "d") of the run, where the rollers stop after paying out 38 ins. of slubbing, the carriage is still maintaining its lead. Of course beyond this point the straight line R has no significance. but the graph of conditions hints that although the fall in the carriage speed is imminent a delivery of 40 or 41 ins. would still be practicable with the same setting of the scroll without any danger of the ends sagging.

Fig. 4 gives a picture of somewhat different conditions when spinning the 32 cut Cheviot yarn with a lower draft typical of that used on high-class all-wool blends. In this case notice how the carriage has reached the same speed as the rollers after covering only 7 ins. of the journey. From this point it gains little by little on the rollers until delivery terminates at "d" where the lines cross. In this case the scroll has been set to give the maximum rate of movement for a much longer part of the run than is the case in Fig. 3, but the fall in speed is beginning to take effect at 45 ins. so that just before the rollers stop there is a hint of an easing off in the tension on the slubbings, a feature noticed during the spinning of this yarn. Having carried out the spinning trials, observing the conditions under which delivery and drawing were carried out, the writer can state with confidence that a much greater difference in speed between carriage and rollers would be required to seriously endanger the stability or cohesion of the slubbings than is shown by the position and extent of the gap between C and R in each graph given here. The effects of different speeds and settings of the drawing-out scroll will be the subject of a subsequent article.

Shetland Cloths

Reproduced full size on the facing page, the patterns shown are a selection from the range of 9/10 ozs., 60 ins. Shetland cloths manufactured by A. Sandison and Sons (Edinburgh) Ltd., Thule Mills, Old Sugar House Lane, Edinburgh, 6. These are quite novel inasmuch that not many Shetland cloths are produced as low as this weight. Brief details are as follows:—

(1) A finely mingled, medium-grey cloth of exquisite handle and beautifully finished surface texture.

(2) Two shades of brown and heather are combined with a very faint striping effect to produce this smart cloth.

(3) Dark-grey and light-grey skilfully warped to give a subdued striping on a mingled ground.

(4) A simple, but extremely effective, cloth in a well-balanced light-brown shade.

(5) Bottle-green and medium-brown are the shades forming an ideal medium for the dark blue striping effect.

(6) Light-green, light-brown and fawn are employed in the yarns for this construction.

(7) Medium-brown and bottle-green (warp and weft) make this distinctive cloth with its very faint double striping effect.

The Measuring Accuracy of the Shirley Analyser*

One result of this investigation showed that an abbreviated test method compared favourably with the original method, giving reliable results at lower cost

By N. B. FURVIK and D. M. SANDELIUS†

A TECHNICAL committee of the International Federation of Cotton and Allied Textile Industries asked the Swedish Institute for Textile Research to investigate the possibility of using the Shirley analyser for determining objectively the lint content of raw cotton. A positive result of such an investigation would imply that lint content according to Shirley analyser tests might be included in commercial specifications of American-type cotton as a complement to specification by grade. A summary of the main results is given in this paper.

Scope

The scope of the investigation was to evaluate the accuracy of lint and trash content in raw cotton as determined by the Shirley analyser. An experiment should be designed to give information about:—

(1) Short period variation in test results.
(2) Long period variation in test results.
(3) Systematic differences between results obtained by different laboratories.

In the experiment two different methods were used, one suggested by Shirley Institute and the other by the Swedish Institute for Textile Research. These are referred to as the "Shirley method" and the "abbreviated method" respectively (descriptions of the two methods are given in an appendix in the full paper).

Experiment

Thirteen mills and laboratories were chosen to take part in the experiment, representing together the following seven countries: Belgium, Denmark, France, Western Germany, Netherlands, Sweden and the U.K. One bale of each of four kinds of cotton were used, all saw-ginned. They had staple lengths of about 1 - 1 1/16 ins. and yielded lint contents of about 93, 94·5, 96 and 97%, respectively. The Micronaire values were between 4·3 and 4·6, and the Pressley indices varied between 6·8 and 9·5.

From each bale a large number of samples were selected according to a special sampling procedure designed to reduce the influence of the lint variation on the precision of the test results. For each cotton eight samples were tested in each of twelve test periods by each laboratory. Four of these were tested according to the "Shirley method" and the others according to the "abbreviated method," and the interval between two consecutive test periods was two weeks. Each testing period covered two consecutive days. The effects of systematic errors were also reduced by allocating the samples by a special randomization procedure.

The tests were to be carried out in a standard atmosphere of 65 ± 2% R.H., and a temperature of 20 ± 2°C. Before the experiment started the participants were asked to check that the analysers were adjusted in accordance with the manufacturer's instructions. The participants also obtained some initial experience by running a few pre-test samples under the same conditions as in the main trial.

Results

Statistical analysis of the experimental results showed that for most laboratories the level of testing fluctuated from one fortnightly period to another. The cottons gave different values for the randoms within period variations. Large differences between laboratories were found for both the within period variation and the between period variation. The larger variations obtained for some laboratories were mainly due to the occurrence of abnormal values, an indication that the testing procedure was not under sufficient control.

Analyses of the trash results give about the same picture as those of the lint results. The variation is, however, lower for the trash data, because there are fewer sources of variation. Moreover, the Analyser was specifically designed for the determination of trash content, not for lint content. Both methods show about the same level of variation. There are systematic differences in the results for the two methods, but these differences show great consistency both for laboratories and cottons. The testing time was found to be about 20% longer for the "Shirley method" than for the "abbreviated method."

In this experiment the standard deviation for the within period variation was found equal to 0·36, a figure based on the results from the five best laboratories. Besides the true experimental error this value of 0·36 also includes the variation between samples. Consequently, it was decided to adopt the value 0·30 for the true experimental error—a value possibly still a little too high.

A standard deviation of 0·30 implies that if there were only this error and we repeatedly make series of, say, k tests on a homogeneous cotton we shall obtain average values for the lint content which do not differ from the true lint content of that cotton by more than:—

$$2 \times 0{\cdot}30/\sqrt{k}$$

in 95 out of 100 cases. If we make one test (k = 1), the limits are ± 0·60, if we make four tests (k = 4) the limits are ± 0·30. Such limits could be used as safety margins or "confidence limits" for average test values of lint content.

* *Summary of a technical research report in "International Review of Cotton and Allied Textile Industries" (Vol. 27—No. 105).*

† *Swedish Institute for Textile Research, Gothenburg.*

Now we shall see how the situation is changed when the long term variation is taken into account. If there are large time intervals between the above test series larger safety margins are needed. In our investigation we found a between period standard deviation of 0·154. The limits will now be:—

$$\pm 2\ \sqrt{0{\cdot}154^2 + ((0{\cdot}30)^2/k)}$$

since standard deviations according to statistical theory add squarely in this case. For $k = 1$ and 4 the safety margins will be 0·68, and 0·43, respectively. Moreover, no matter how many tests are made over a short period, the safety margin will not become smaller than:—

$$2 \times 0{\cdot}154 = 0{\cdot}31.$$

So far we have only covered the ideal case of a homogeneous cotton. In practice we also have the variation due to the cotton itself. This variation can be split up into a variation within bales and a variation between bales. As a matter of fact the error of the test procedure is much smaller than the error due to cotton variation in normal shipments. Then the safety margin will take the form:—

$$2\ \sqrt{0{\cdot}154^2 + A}$$

where A covers cotton and short period variation.

It is true that A can be made small by increasing the number of tests and the number of bales sampled. However, the formula shows that the between period variation cannot be neglected when all tests are carried out over a short period. Only in comparisons between two or more series carried out during the same test period the long-term variation can be neglected.

Summary

An investigation of the measuring accuracy of the Shirley Analyser showed that besides the short period variation in test results there is a long period variation, which can be neglected only in comparisons between test series carried out during the same short test period (usually one day or a few successive days). Another result is that an abbreviated test method compared favourably with the original method, giving equally reliable results at a lower cost. Finally, several of the participating laboratories were able to keep the testing variation low compared with the cotton variation in normal shipments. This suggests that determinations of lint content using the Shirley analyser would be a helpful tool in the cotton trade.

New Type Flight-Bar Cotton Gin

CLAIMED to separate cotton seed from lint six to eight times faster than conventional roller or saw gins without damaging the fibre a new, high-capacity flight-bar cotton gin has been developed by the United States Department of Agriculture's Southwestern Cotton Gin Research Laboratory at Mesilla Park, N.M., under the supervision of J. M. Williams, Jr. In recent tests, the new gin is reported to have turned out nearly 20 lb. of lint cotton per inch of roller per hour with extra-long staple cotton, whereas modern commercial roller gins average only about 2½ lb. per inch of roller per hour. On the relatively shorter-staple upland cotton, the capacity of the new gin in laboratory tests approximated 13 lb. per inch of roller per hour. This compares with barely more than 2 lb. capacity for this cotton in a commercial roller gin and about 9 to 10 lb. capacity in a modern saw gin.

Mr. J. M. Williams, Jr. (Agricultural Engineer, U.S. Dept. of Agriculture) with the new high capacity "flight bar" gin. The new machine is said to work six to eight times faster than conventional roller or saw gins

The new principle involved in the machine is a flight-bar attachment which replaces the vibrating knife used in conventional roller gins. Two endless chains, to which square steel bars as long as the ginning roller are fastened slat-like at 2 ins. intervals, comprise the flight-bar attachment. As seed cotton is fed on to the gin from above, the lint or fibre adheres to the ginning roller, which is of conventional design. A stationary knife set close and parallel to the roller holds back the seeds as the lint is pulled by the roller. The chains, operated by sprockets, pull the flight bars across the stationary knife, thereby removing the seed as the fibre is pulled between the knife and the roller. This action serves, as does the conventional but less efficient vibrating knife, as a means of removing seeds from the lint. Doffing the lint from the roller, by rotary brush, or by a blast of air or steam, completes the ginning operation. The ginning action is similar to that of pulling the fibre from the seed by hand.

By adapting a conventional cotton-conveying blower to the new experimental gin, the return to the feeder of any mixed seed and lint not separated the first time through by the roller and bars, was made possible and resulted in a complete operating unit.

It is believed that a commercial gin based on the design and principle of this improved experimental gin would encourage some replacement of saw and roller gins in current use. However, extensive tests of Upland and extra-long staple varieties grown and harvested under a wide range of conditions are planned to determine the mechanical limitations of the machine and the fibre and spinning qualities of the cotton after ginning. Maximum practical roller speed and the spacing and speed of the flight bars in relation to the roller speed for optimum efficiency must still be determined.

The Determination of Light Fastness

The only cost of the method recommended by ISO is the cost of the standards — which is very low

By K. McLAREN†

THE science underlying the application of dyes to textile fibres and other substrates such as leather, paper and plastics is to fix on them a chemical compound that absorbs some or all of the light falling on the material; the light that is not absorbed but is reflected determines the hue of the material, so that, for example, it is red if only red light is reflected and is black if all the light is absorbed, the absorption of some light, therefore, being absolutely essential. Light is, however, a form of energy, and unfortunately, when a dye molecule absorbs ultra-violet or visible light it is converted into what the physical chemist terms an "excited state." This term is very apt, as a molecule in such a state is much more reactive than in the unexcited or "ground state" and may be destroyed by interaction either with the textile fibre or with oxygen in the air. These photochemical reactions are by no means well understood, although the subject has been studied by numerous investigators over the past fifty years. The first approach was primarily from an organic chemical standpoint, that is, through the identification of the products of the photochemical degradation of dyestuffs, and an excellent account of this work (and other aspects of photochemistry in relation to textiles) has been given by Schaeffer (1). In recent years more attention has been given to the physical and physico-chemical aspects, as follows:—

(1) The regions of daylight (consisting of visible light plus ultra-violet and infra-red radiations) which cause fading (McLaren (2) and Cooper (3)).

(2) The general nature of photochemical degradation of dyes on wool, silk and nylon on the one hand (reduction by the fibre) and on cellulose, polyester fibre, etc., on the other (oxidation by air) (Giles (4)).

(3) The effect of different gaseous atmospheres on the fading rates of basic dyes on "Orlon," etc. (Schmidt (5)).

(4) A fundamental investigation into the nature of the two excited states (singlet and triplet) by the new technique of flash photolysis (Porter and Windsor (6), Bridge and Maclean (6a)).

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Interesting though these fundamental reactions may be, dyestuffs and textile technologists are primarily concerned not with how they occur, but with how rapidly, with the ultimate objective of ensuring that the finished article, be it an evening gown or a curtain, will not be faded badly by the light which must fall on it during its lifetime in use. The first and most important step in attaining this objective is to determine the rate of fading, which in this connection is usually referred to as the light fastness.

Determination of Light Fastness

Light fastness testing has been on an acceptable scientific basis since 1914 when the Deutsches Echtheits Kommission published its standard methods for fastness testing (7). The principle adopted by the D.E.K. was to expose the specimen under test with a set of standards of varying fastness and, when it had faded, to compare the amount of fading with the varying amounts of fading of the standards; if the specimen had faded as much as standard No. 3, then its light fastness was said to be 3.

This basic principle is still in use today although it has been modified and improved to a marked degree. The final development is contained in the test recommended by ISO (International Organisation for Standardisation) which is the result of close collaboration extending over many years between England, Germany, Switzerland and France. This method should eventually be adopted as a national standard testing method by the following countries:

Australia	Finland	Italy	Roumania
Austria	France	Japan	South Africa
Belgium	Germany	Mexico	Spain
Brazil	Greece	Netherlands	Sweden
Bulgaria	Hungary	New Zealand	Switzerland
Czechoslovakia	India	Norway	Turkey
Canada	Indonesia	Pakistan	United Kingdom
Chile	Ireland	Poland	U.S.S.R.
Denmark	Israel	Portugal	Yugoslavia

and it has already been adopted in the U.K. as B.S. 1006:1955. The absence of the U.S.A. from the list may cause surprise, particularly as they hold, jointly with the U.K., the secretariat of the ISO Colourfastness Sub-committee (ISO/TC38/SC1); the reason for this will be discussed later.

Methods fundamentally similar to the ISO recommendation have been used in Europe for many years, the differences between them being in the use of different standards and somewhat different methods of using them. Attempts were made in 1937 by England, Germany and the U.S.A. to reach agreement on a common set and when these negotiations were interrupted by the war, the English and German sets differed only in respect of Standards 4 and 7, the American standards being identical with the German; in 1954, the remaining differences within Europe were eliminated by England accepting the German Standard 4 and continental Europe, the English 7.

The internationally accepted standards are pieces of wool dyed with the following dyestuffs:—

Standard 1	Acilan Brilliant Blue FFR ..	(C.I. Acid Blue 104)
Standard 2	Acilan Brilliant Blue FFB ..	(C.I. Acid Blue 109)
Standard 3	Benzyl Cynin 6B	(C.I. Acid Blue 83)
Standard 4	Supramina Blue EG	(C.I. Acid Blue 121)
Standard 5	Solway Blue RN	(C.I. Acid Blue 47)
Standard 6	Alizarin Light Blue 4GL ..	(C.I. Acid Blue 23)
Standard 7	Soledon Blue 4BC	(C.I. Solubilised Vat Blue 5)
Standard 8	Indigosol Blue AGG	(C.I. Solubilised Vat Blue 8)

the numbers referring to the new Colour Index (8).

A set of ISO Master Standards is filed in each country and working standards are exposed against these by the authorities before issue to ensure equivalence. Although it is not possible to give any precise information concerning the length of the time needed to produce a certain amount of fading on each of these standards (daylight being so variable) the following guide may be useful to anyone not familiar with the 1-8 scale:—

Standard 1 shows a slight fade after one hour's exposure to bright summer sunshine, even in Manchester, whilst Standard 7 shows only a little fading after one year's exposure; the intermediate standards are reasonably evenly spaced, each being about twice as fast as the preceding one; Standard 8 shows little fading even after several years' exposure.

The most important features of the ISO method of using the standards are as follows:—

(1) Exposure is to daylight behind window glass, the exposure racks facing due south in the northern hemisphere, north in the southern hemisphere and sloping at an angle to the horizontal equal to the latitude of the exposure station; these requirements ensure that the time required is a minimum.

(2) Specimens are faded to two or three different degrees before assessment so that an overall picture of the fading rate is given; the degrees of fading are specified by reference to the ISO Grey Scale for Assessing Change in Colour. If the initial fading rate is seriously different from the overall rate, this is separately reported.

This method has been subjected to a critical investigation (9) by the two most important criteria of any fastness test—is it reproducible and is it reliable? These terms, particularly the latter may, perhaps, need some explanation:—

Reproducibility

This term means that whenever and wherever the exposure is made (time and place are not specified in the test) the same results will be obtained.

Reliability

To understand the meaning of this term it is necessary to appreciate that the ultimate requirement is fitness for purpose and in order to do this it is necessary to establish minimum light fastness requirements for various end-uses. This has not been investigated as extensively as light fastness testing (or at least, much less has been published) but, for example, minimum light fastness requirements have been established by the British Standards Institution for four classes of goods, viz.:—

Woven rayon lingerie	— 2
Woven rayon dress and blouse fabrics	— 3
Multicoloured upholstery fabrics	— 4
Single-coloured upholstery fabrics	— 5

and also by other bodies such as the International Association for the Felisol Fastness Label. If a fabric meeting these requirements fades badly during normal use, then this does not necessarily mean that the fastness test is unreliable: it may well be that the minimum level has been set too low, perhaps to ensure that all hues could be obtained.

However, it is simple to decide if the test has been unreliable: suppose that for a certain end-use a minimum light fastness of 5 was considered necessary and that a fabric whose light fastness was 5 faded badly in use; if standard 5 would have faded to the same extent under the same conditions of use, then the level is too low; if it was found to be only 4 or 3, then the test is unreliable.

The detailed investigation showed that for the majority of coloured materials the test was both reproducible and reliable. There were, however, a significant number of cases where the test was not reproducible as differences of as much as three grades were found between exposures made in different places. One of the most impressive examples was the azoic combination Brentamine Fast Scarlet R/Brenthol AN and results obtained in different places are given in Table 1.

These variations were found to be due to the varying moisture content of the specimen during exposure: some materials, particularly azoic combinations on cellulose, fade much more rapidly when the moisture content is high but the standards were deliberately chosen for their insensitivity to differences in moisture content—that is why they are on wool and not on cotton (10). Under moist conditions, therefore, a sensitive pattern will fade more rapidly relative to the standards and hence will receive a lower rating.

Table 1

Time of Exposure		Place	Light Fastness
Year	Months		
		United Kingdom	
1953-54	Nov-Apl	Blackley, Manchester	4
1954	Apl-June	Wilmslow, Cheshire	4–5
	July	Wilmslow, Cheshire	4–5
	July-Aug	Leeds, Yorkshire	4–5
1955	May-June	Wilmslow, Cheshire	5
	June-Aug	Blackley, Manchester	5
		Wilmslow, Cheshire	5
		Glasgow	5
		Manchester City	5
		Didsbury, Manchester	5
		Wembley, Middlesex	5
		Clayton, Manchester	5
	July-Aug	Wilmslow, Cheshire	6
	July-Sept	Blackley, Manchester	5
	Sep-Mar	Blackley, Manchester	4–5
1956	Jan-May	Blackley, Manchester	4–5
	May	Glasgow	5
		Leeds	5
		Wilmslow, Cheshire	5
		Wembley, Middlesex	5
		Overseas	
1954/55	Nov-Feb	Bombay, India	6–7
1955	June-Oct	Providence, R.I. U.S.A.	6
1955/56	Dec-Mar	Providence, R.I., U.S.A.	6
1956	Feb-Apl	Bombay, India	6–7
	May	Bergen, Norway	4–5
	May-July	Melbourne, Australia	4–5
	May-June	Gothenburg, Sweden	5
	May-Aug	Leverkusen, Germany	5
	May	Copenhagen, Denmark	5–6
	May-June	Providence, R.I., U.S.A.	5–6
	May	Delft, Holland	6
	May-June	Verviers, Belgium	6
	May-July	Basle, Switzerland	6
	May-June	Toronto, Canada	6
	May-June	Villiers-St. Paul (Oise), France	6
	May-Aug	Johannesburg, South Africa	6
	May	Cairo, Egypt	6–7
	May-June	Milan, Italy	6–7
	May-June	Aigues-Mortes (Gard), France	6–7
		St. Clair (Isere), France	6–7
	July-Aug (monsoon period)	Bombay, India	5

The moisture content during exposure is governed by the relative humidity of the air in contact with the surface of the specimen, called, for simplicity, the "effective humidity;" because sunlight makes the specimen warmer than the atmosphere the moisture content is much more affected by the proportion of sunlight occurring during the exposure period than by the relative humidity of the atmosphere. Two examples illustrate this very well: the light fastness of moisture-sensitive materials is much higher if exposed in Bombay between November and March than if exposed in Manchester between April and August even though the average relative humidity is almost the same; the average amount of sunshine in Bombay is, however, 10 hours per day compared with only four in Manchester Even during the monsoon period Bombay receives more sunshine than Manchester does in winter and hence higher results are obtained with sensitive specimens (see Table 1).

The reliability of the test, however, was found to be excellent even with moisture-sensitive specimens, but only if the exposure is made in the same country as that in which the material is to be used or one with a similar amount of sunshine. Reproducibility and reliability are in a minority of cases, therefore, mutually exclusive and although one could modify the test to achieve reproducibility (for example by using the original American Sunlight test) to do so would reduce its reliability, a most undesirable consequence.

This conclusion, however, creates a particular problem for a dye maker whose products may be sold all over the world. It is clear that light fastness exposures made in only one place cannot necessarily be universally reliable nor will the figures published by different manufacturers for identical products be the same even though the same test and same Standard depths are used in Europe. Giles (11) statistically analysed 432 light fastness figures published by I.C.I. and five continental European dyemakers and found that the figures for equivalent acid dyes on wool were almost identical (dyes on wool are not sensitive to differences in moisture content) whilst those for direct dyes on cotton were given ½ to 1 grade higher rating on the continent. Giles attributed this to the differences in sunshine in Manchester (2·9 hours) and Basle (4·6 hours) the latter figure probably applying also to Leverkusen and Ludwigshafen. This conclusion is, however, vitiated by the fact that the old Standard depths used by I.C.I. for dyes on cotton (12) were significantly weaker than those used in Europe.

However, in order to overcome all these difficulties, the Dyestuffs Division of Imperial Chemical Industries Ltd. decided in June, 1956 to determine light fastness in two different places, one (Wilmslow, Cheshire) being typical of the predominantly cloudy areas of the world and the other (Bombay, India) representing the sunny regions—the daily sunshine average during the exposure period being 4 hours in Wilmslow and 10 in Bombay. Moisture-sensitive specimens are rated higher in Bombay than in Wilmslow and the difference is a measure of their sensitivity. In certain cases (some disperse dyes on hydrophobic fibres, for example), a lower result is obtained in Bombay.

An ISO test conducted in the country in which the material is to be used is only reliable, however, if the material in use is not exposed to light when wet. This does happen in many cases: for example, curtains come into contact with condensed water on window panes, washable articles are hung in the sun to dry and, of course, there is the extreme case of awnings, tent and sail cloths, tarpaulins, etc., which are subjected to weathering. To provide an additional test for fabrics such as curtains and washable articles, The Light Fastness Sub-Committee of the Society of Dyers and Colourists has recently published a tentative test "Colour Fastness to Daylight at High Humidity" (13) which consists of exposing the specimen under test and the standards *facing north*. Under such conditions the patterns are not heated by the sun's rays and therefore the effective humidity approaches the relative humidity which in the U.K. is on average, about 70%; the normal (south facing) daylight exposure in the U.K. is conducted at an average effective humidity of only 20% (14). Similar high-humidity exposures have also been independently advocated by Friele and Selling (15).

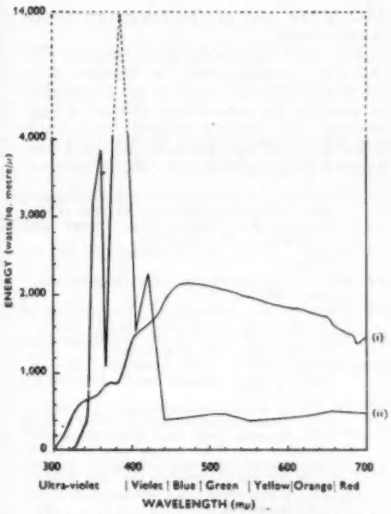

Fig. 1. (i) Sunlight and skylight (maximum); (ii) Enclosed carbon arc (2 kW)

The problem of weathering is more complex and a detailed review of the problem has recently been published (16); an international Working Group consisting of investigators in Denmark, France, Germany, Netherlands, Norway, Sweden, Switzerland, U.K. and U.S.A. under Swiss leadership was formed by ISO in September, 1958 to continue work on this problem.

Whilst the ISO test as a general light fastness test is believed to be quite satisfactory and no work is being done to modify it, it does suffer from one serious defect—the time required to obtain a result; in England, this may be a year if the specimen has a light fastness above 6. For this reason, the use of fading lamps has been widespread since they were marketed about 1900, but in Europe, their use has, until recently, been regarded with suspicion, as experience has shown many serious discrepancies between the results obtained on exposure against the standards in a lamp and in daylight.

A detailed study of the possible causes of these discrepancies has been made and the following conclusions reached:—

(1) The chief cause was found to be differences in moisture content during exposure and occurred mainly with cellulosic fibres: the discrepancies were even greater than can occur in daylight exposures (14). To duplicate exposures made in England, fading lamps should operate at an effective humidity of 20% (17).

(2) Surface temperature of the specimen was found to be important in the case of synthetic fibres such as "Orlon" (18). For this reason the recommended black panel temperature for the Atlas Fade-Ometer was reduced in 1956 from 74°C to 63°C.

(3) The last possible cause is the fact that until 1954, most of the fading lamps in common use employed an enclosed carbon arc as a light source; Fig. 1 shows that the nature of its light is quite different from daylight and this was found to cause anomalous results in certain cases (2).

Whilst the correct temperature and effective humidity can be obtained by good lamp design, the enclosed carbon arc cannot be modified to resemble daylight and because of that, ISO has never accepted any carbon arc fading lamp test. However, in 1954, a radical departure in lamp design occurred when Quarzlampen G.m.b.H. working in close collaboration with Casella marketed the Xenotest, a lamp based on a xenon arc whose light is practically identical with daylight as shown in Fig. 2. An account of the development of this lamp has recently been given by Toepffer (19).

At last complete reliability becomes a possibility for providing that the specimen is exposed at the correct temperature and moisture content, results identical with those obtained for a daylight exposure should theoretically be obtained. Friele and Selling (15) have already reported better correlation on synthetic fibres with the Xenotest than with enclosed carbon arc lamps although Norton et al, (20) found little difference between them.

Position in the U.S.A.

It has already been mentioned that the U.S.A. has not accepted the ISO Recommendation for light fastness testing; this is particularly disappointing as in 1940 the AATCC established light fastness standards which were identical with the 1939 German standards (and, therefore, practically equivalent to the 1940 British standards). With such a promising start to international co-operation in this field, it is obvious that there must be very compelling reasons for the American refusal and these can best be appreciated if the history of light fastness testing in the U.S.A. is considered.

Work on light fastness testing was started by the AATCC in 1933 and this involved the examination of both the British and German standards as well as over 1,000 other dyed patterns. The final outcome of this stage was the adoption in 1940 of eight standards which were identical with the 1939 German series. However, they were not so strictly in geometric progression particularly when Standards 1-4 are exposed in a carbon-arc fading lamp, (the cause actually being the difference between carbon-arc light and daylight (2)) which has never been regarded as of great significance in Europe where much less reliance is placed on carbon-arc fading lamps. In the U.S.A., however, where such lamps are ubiquitous, there is a surprising reluctance to use any standards, even their own—a reluctance which has never been explained—and most assessments are based on a geometrical series of Standard Fading Hours; hence if standards exist, they must be geometrically spaced in a carbon-arc fading lamp. Attempts to find eight blue dyestuffs which could be applied to wool, which would possess all the stringent requirements for a light fastness standard and which would show perfect geometric spacing both in sunlight and in fading lamps, failed and in 1943 Christison (21) proposed a fundamentally new approach to the problem. This was to produce the standards by blending various amounts of two lots of slubbing, one dyed with 0·3% Erio Chrome Azurole B (Mordant Blue 1) which has only moderate light fastness and the other with 3% Indigosol Blue AGG (Solubilised Vat Blue 8) which is the dye used for the European (and now ISO) Standard 8. It is obvious, of course, that such a method would enable a much closer approach to perfect spacing to be obtained without any serious defects providing assessment is made at an early stage of fading only and the mottled appearance of a faded standard can be tolerated; they are not, however, suitable for the progressive fading method used in England since 1934 which has now been accepted by ISO.

A similar mixture-method was also adopted in the U.S.S.R. in 1949 using Indigosol Blue AGG and Indigo Carmine, but was subsequently abandoned by them in favour of the ISO Recommendation.

In 1945, the Christison standards were adopted by the AATCC to replace the German standards previously used; the composition of the Christison standards was as follows:—

	Fugitive Component
L 2	100·00%
L 3	60·70%
L 4	36·84%
L 5	22·36%
L 6	13·57%
L 7	8·24%
L 8	5·00%

(There has never been an L 1 standard)

Unfortunately, however, the new standards had quite different fastness ratings from the earlier ones bearing the same numbers; for example, the light fastness

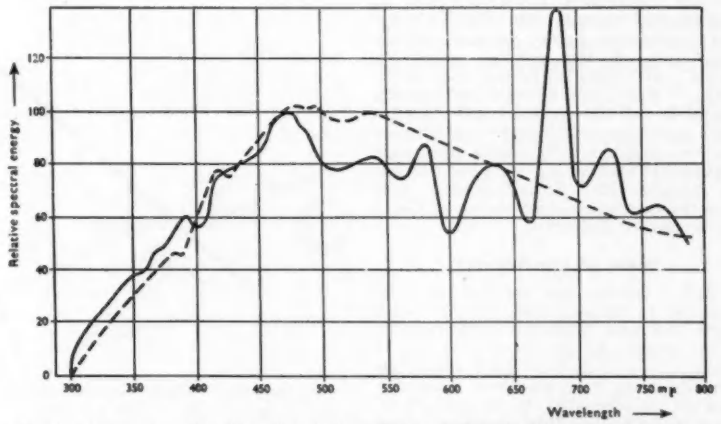

Fig. 2. Xenon Arc Xe 1500, filtered through the glass-water filter in the xenotest. - - - Natural radiation, i.e. radiation of sun and sky on horizontal plane in medium latitudes

of L 2 was between the old 3 and 4, whilst L 8 was not as fast as the old 7; the new Amercian standards thus cover a considerably narrower range.

Between 1945 and 1956 when the ISO standards (which were not significantly different from the 1939 German ones), were accepted by the other members of ISO so much light fastness data had been accumulated in the U.S.A. on the Christison scale, that considerable disruption would ensue if the Americans went back; so rejection of the ISO method was inevitable. Apart from the difference in standards, there are two other differences between the ISO and AATCC natural light tests which must be considered: The first concerns the stage of fading at which the assessment is made and the second, the exposure conditions.

Until 1956, the AATCC method specified assessment when "just appreciable fading" had occurred which meant a change that was "immediately noticeable," a term which is somewhat subjective; since 1956, however "just appreciable fading" is defined as being visually equal to Grade 4 on the international geometric grey scale which is much less subjective. The ISO method specifies progressive exposure and assessment at Grade 4 and Grade 3 contrast and if these are different, then the mean is taken.

Until 1957, the AATCC method specified exposure between 9 a.m. and 3 p.m. on sunny days between April 1 and October 1, i.e., conditions of very low effective humidity. In 1958, however, this Sunlight Test (16B—1957) was supplemented by a Daylight Test (16C—1957) in which the exposure conditions were identical with those of the ISO Recommendation, i.e. 24 hours per day at any time of year. This Amercian Daylight Test has now been accepted by the ISO Colour Fastness Sub-Committee as a Draft Proposal for ISO Recommendation, to be used where the U.S.A. is concerned but whether it is finally accepted by ISO or not, it is unlikely to be abandoned by the AATCC. Because of the importance of the U.S.A. in international trade, there must be in effect two daylight tests and the natural question is "can the results obtained by the ISO method be converted into AATCC results and vice versa as for example, °C and °F are inter-related?".

Opinions differ on the feasibility of this: Norton et al (20) concluded that:

"Any conversion factor or chart of equivalents between the AATCC and ISO standards would, because of the magnitude of the possible variations, be of questionable usefulness and significance." The author, however, by analysing the immense data in this paper, found a very high correlation coefficient between the two systems, 0·94 which was much higher than between any lamp and daylight or sunlight (22). From this and other data the correlation chart shown in Fig. 3 was published (23).

What of the Future?

Half a century ago the first scientific attempts to measure light fastness were made and now, with the publication of a test which should be adopted by 36 countries, an important land mark has been reached; it is, therefore, a suitable time to consider what developments may occur in the future. The likelihood of the development of an international fading lamp test has already been mentioned together with possible extensions of the ISO Recommendation to cover conditions of high humidity and weathering, but the most important question is whether the standard method will be significantly altered in the future.

Although prediction is dangerous, the author feels that the ISO Recommendation will remain essentially as it is for many years. This is because of the immense amount of work which has been done on this problem—it is probably true to say that more has been done on light fastness testing than on all the other fastness tests combined. It has been subjected to a severe critical investigation, one designed to find any potential weaknesses and, providing its few limitations are remembered, it has emerged successfully. Not only is its permanence assured but its use will undoubtedly spread to non-textile fields. Already in the U.K. it has been officially adopted for plastics, anodised aluminium and leather, whilst it has been strongly recommended for testing pigments.

Undoubtedly other methods of light fastness testing employing instruments will be devised; the use of a pyrheliometer and Langley meter is receiving considerable attention in the U.S.A. although the latest report states that "under no circumstances should evaluation of colour fastness be attempted without the simultaneous exposure of the recognised AATCC blue light fastness standards or a known standard of the same material." doubtless further attempts will be made to perfect a method of measuring the amount of fading instead of relying on the human eye. It is, of course, much more satisfying for a scientist to report light fastness as, for example "400 Langleys produce 1·8 N.B.S. units of colour change" but it is doubtful if such information would be of greater value to the textile technologist who has to decide whether a dye or dyed material is suitable for table cloths or curtains. These instrumental methods possess one defect—they are extremely expensive whereas the only cost of the method recommended by ISO is the cost of the standards, which is very low.

It would, therefore, seem certain that the ISO method will be assured of a relatively long life and in all probability in another 50 years time, the term light fastness will (outside of the U.S.A.) still bring to mind the 1-8 scale of the International Organisation for Standardisation.

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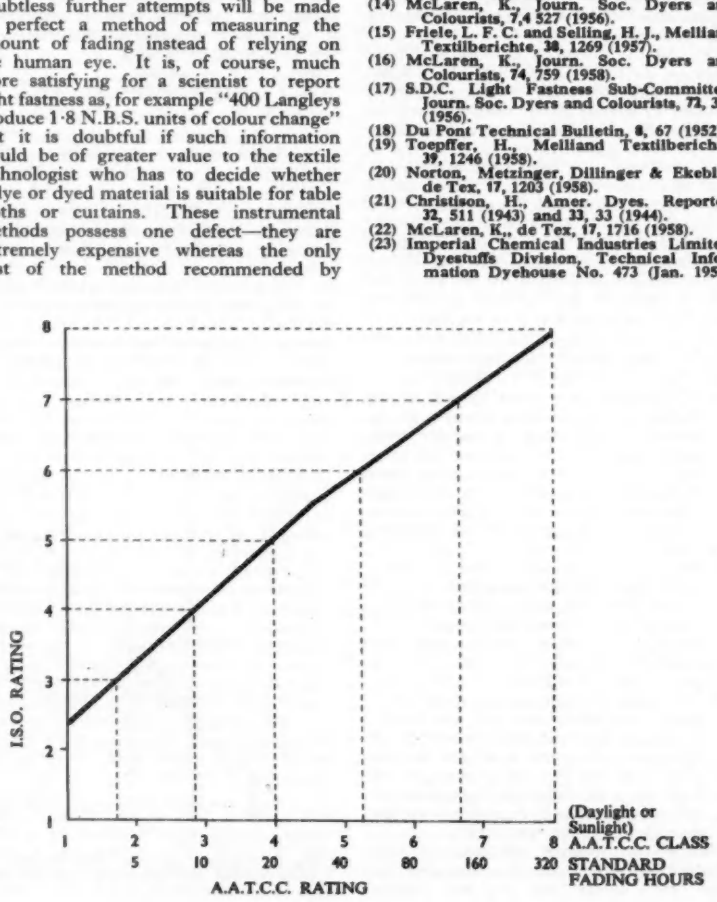
(23) Imperial Chemical Industries Limited, Dyestuffs Division, Technical Information Dyehouse No. 473 (Jan. 1959).



Pendulum Weighting Arms and Top Rollers

In the pendulum weighting arm, each top roller is individually loaded and remains constant irrespective of the roller setting

SKEFKO BALL BEARING CO. LTD.

IT is now about 20 years since SKF began to develop the principle of pendulum guidance and centre suspension for the top rollers of cotton ring frames. Following the introduction of the successful roller bearing spindle, the tape tension pulley and the ball-bearing top weighting rollers, it today provides another notable example of the success achieved by SKF in the field of textile spinning machinery. The company's pendulum weighting arms and top rollers have a world-wide reputation and some 5 million spinning spindles have been equipped with SKF pendulum weighting arms and more than 18,000,000 SKF top rollers have been supplied.

About 10 years ago a new era began in the construction of cotton ring frames with the introduction of the pendulum weighting arm. This arm has made possible the design of very efficient high draft mechanisms for the production of high quality yarn and the very successful features of the design have won for it a wide-spread acceptance in the industry. The SKF system embodies the following three principles:—

(1) Centre suspension of the top rollers.
(2) Individual spring loading of the top rollers from above.
(3) Freedom of movement for the guide arms which support each top roller individually, thus ensuring perfect self-alignment of the rollers.
(4) Suitable arrangements for the perfect guidance of the top and bottom aprons, anti-friction top rollers of SKF design.

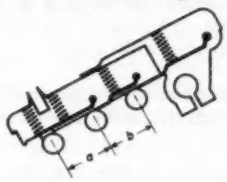


Fig. 2

Centre Suspension of Top Rollers

The introduction by SKF of centre suspension and pendulum guidance for

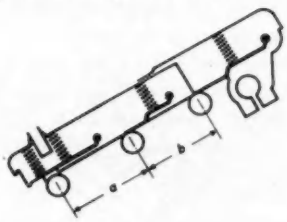


Fig. 3

the top rollers in ring spinning frames was a very important step in the elimination of the irregularities caused by lint accumulation and wear of cap bars, disadvantages which are inherent in cap bar drafting systems (Fig. 1). A drafting mechanism with centre suspended top rollers is cleaner and lends itself more readily to fly removal. Another disadvantage of lateral guidance for top rollers is that they are seldom in perfect alignment with their corresponding bottom rollers because, in practice, the cap bars are not adjusted for perfect alignment. Such faults lead to nip line displacements of varying importance.

These shortcomings in drafting mechanisms with laterally guided, self- and lever-weighted top rollers meant that only relatively low total drafts were possible. In fact, the magnitude of the total draft obtainable is closely related to the efficiency of the fibre nip and the uniformity of the drafting.

Individual Spring Loading for Top Roller

SKF have always recommended spring loading from above as embodied in their pendulum weighting arm, and the success of this design has proved the effectiveness of this type of loading. However, all types of spring loading are not necessarily satisfactory. The correct functioning of the drafting mechanism depends largely on the design of spring loading adopted, and

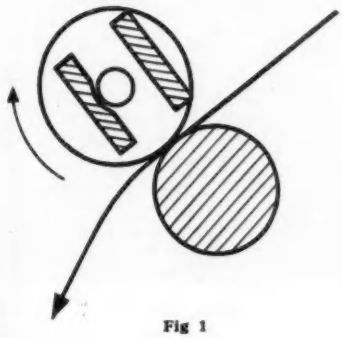


Fig 1

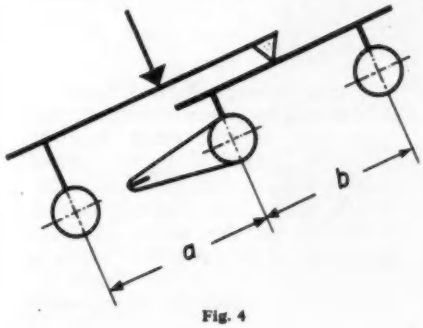


Fig. 4

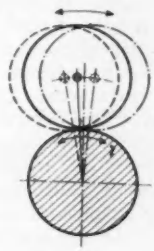
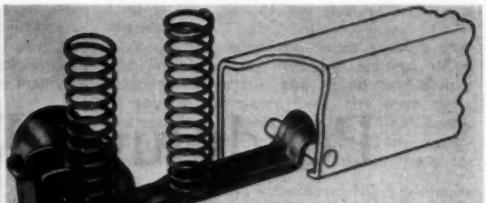


Fig. 5



(above) Fig. 6

(right) Fig. 7

particularly on the way in which the pressure exerted by the springs is transmitted to the top rollers.

In the SKF pendulum weighting arm, each top roller is individually loaded (Figs. 2 and 3) and there is therefore no interference whatsoever from the adjacent rollers. This design is claimed to offer important advantages compared with loading systems in which only one loading spring acts on all three top rollers through a system of levers (Fig. 4). Because of the individual loading springs in SKF pendulum weighting arms, the loads on the top rollers remain constant, irrespective of the

Fig. 8

roller setting (Figs. 2 and 3). Fig. 4 illustrates the principle of lever loading. The loading pressures vary according to the alterations in the roller settings (Fig. 4, a and b). This system is very sensitive to vertical movement of the top rollers which may be due to eccentricity of the top and/or bottom rollers or to variations in the apron thickness. In such a system vertical movement of one of the three top rollers will also cause the other two top rollers to move in the drafting plane, even if the latter two rollers are running true. This occurs because all three top rollers are connected to one another (Fig. 4).

Movements of the front top roller in the drafting plane also cause a displacement of the nip line between the front roller pair (Fig. 5). Even slight nip line displacements, particularly at high drafts, may cause faulty drafting. For instance, a nip line displacement due to a roller eccentricity of only 0·002 in. causes periodic variations in yarn thickness and the examining board clearly shows the moiré yarn (Fig. 6). It will be understood that all three pairs of rollers must be absolutely concentric when the top rollers are loaded as illustrated in Fig. 4. It is, of course, not possible to achieve such conditions in mill practice.

Freedom of Movement of Individual Guide Arms

In the SKF pendulum weighting arm, each guide arm supporting a top roller at its point of symmetry, has pendulum action, and is loaded by one

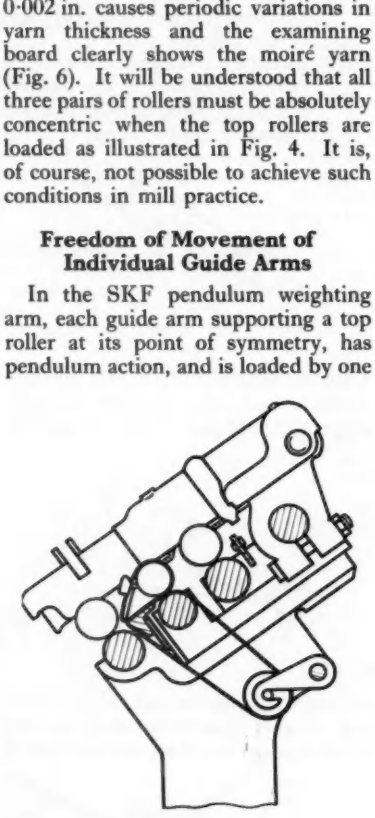


Fig. 9

or two coil springs (Figs. 2, 3 and 7). As this loading system is virtually free from mass inertia, which may be caused by weights or by the friction of the top roller nebs in the cap bars, it will follow the slightest vertical movement of the roller. Vertical movement of the top rollers, which is due to roller eccentricity should be avoided, as it causes the displacement of the nip line and consequently faulty drafting. In practice slight changes in the position of the top rollers are unavoidable. With the SKF pendulum weighting arm the detrimental effects of such irregularities (top roller eccentricities) are reduced to a minimum.

Due to the pendulum action of the guide arms of the SKF pendulum weighting arm, the top rollers are free to swing in a vertical direction and also to tilt. This feature ensures that in driving the top roller, the bottom roller brings it into parallel alignment and holds it there during operation.

Double Apron System

The double apron system provides control of the fibres between the aprons to a point very close to the nip line of the front roller pair. Thus, the number of floating fibres, which are not controlled in the main field during drafting, is substantially reduced. The SKF pendulum weighting arm controls and guides the aprons by means of simple components, and the top and

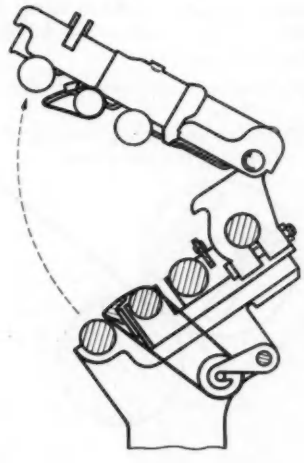


Fig. 10

bottom aprons are easily separated. The top rollers, aprons and cradles, are lifted from the drafting plane when the pendulum weighting arm is raised (Figs. 8, 9 and 10). Thus, all parts of the drafting mechanisms are easily accessible.

The absence of cap bars simplifies the construction of the drafting system and prevents excessive lint accumulation (Fig. 11). Moreover the system can easily be cleaned by overhead cleaners. The pendulum weighting arm PK 211 E was designed especially for the double apron system and offers excellent conditions and super high drafts can be obtained in cotton ring-frames. The double apron drafting arrangement with the SKF pendulum weighting arm permits total drafts of between 30 and 40 for carded cotton; if good class cotton and good roving are used, even higher drafts are possible. For combed cotton, total drafts of about 60 can easily be obtained. The fact that low as well as very high total drafts can be used also offers the important advantage of spinning a large range of yarn counts from a given roving. Roller settings need not be altered for different staple lengths. In this connection it is interesting to note that the double apron drafting system can easily be converted to the single apron arrangement, if synthetic fibres have to be spun.

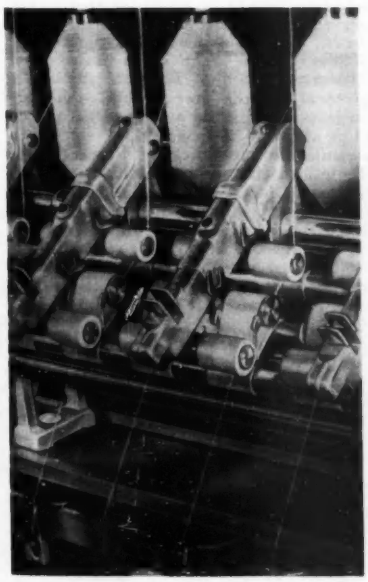


Fig. 11

Anti-Friction Top Rollers

The reliable operation of the top rollers is essential to the efficiency of a high drafting mechanism. The smooth, uniform, and reliable operation of the top rollers, which is essential to good drafting, can only be achieved for present-day high top roller loads, provided the top rollers used are equipped with bearings specially designed for the purpose.

More than 20 years ago SKF designed a ball bearing top roller which fully met the requirements of that time and is still largely used. Profiting from their long experience in the manufacture and the application of ball-bearing top rollers, SKF developed, about 10 years ago, another special bearing unit for top rollers. The simple fitting and maintenance features of these top rollers and the sealed design of their bearing units, fully meet the demand of the mills for rollers that are completely reliable in operation. The SKF fixed boss top rollers (Type FP) are usually used in the back line of the double apron drafting system with SKF pendulum weighting arm PK 211 E (Fig. 12). The SKF loose boss top rollers (Type LP) are used as apron top rollers and front top rollers (Fig. 13). The bosses of the SKF loose boss top rollers can be removed and replaced by hand from the outer rings of the bearing units. When mounting, the snap ring in the boss clicks into a groove in the outer ring of the bearing unit, and thus retains the boss in its operating position.

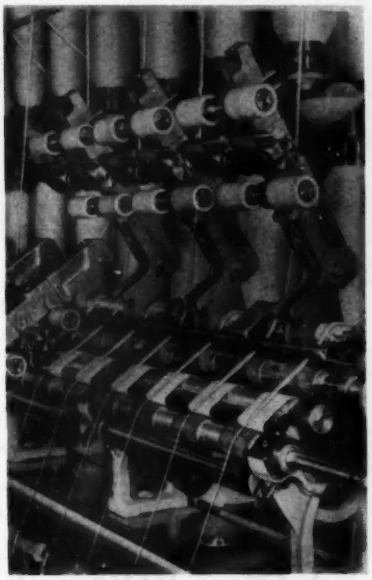
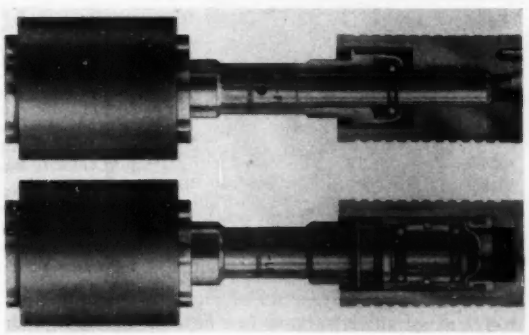


Fig. 12

Application of Pendulum Weighting Arm

Figs. 15 and 16 show standard double apron drafting arrangements with SKF pendulum weighting arms PK 211 E 1. The short top apron cradle shown in Fig. 13 can be used for fibres up to $1\frac{27}{32}$ ins. (47 mm.) long, the top apron cradle (Fig. 14) being suitable for fibres up to $2\frac{1}{2}$ ins. (60 mm.) long. The system is particularly suitable for a changeover from short to long staple spinning, or conversely. It is only necessary to replace the top apron and cradles, all other drafting components remaining the same. The drafting fields have to be re-set, of course.

The top apron roller and the rear top roller are cleaned by separate clearer rollers, which are supported in holders



(top) Fig. 13

(below) Fig. 14

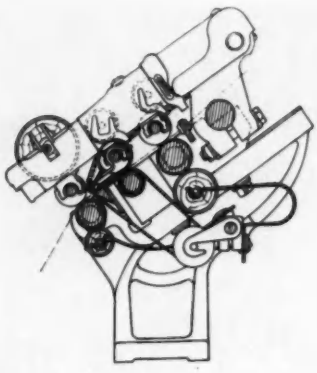


Fig. 15

fitted to the sides of the top roller guide arms (Figs. 15 and 16). When overhead cleaners are used, these top clearer rollers may be omitted and use made of SKF pendulum weighting arms without clearer holders on the middle and the rear guide arms.

SKF textile accessories incorporate the high qualities of precision and engineering craftsmanship that for over 50 years have characterised the world-famous SKF ball and roller bearings. The Technical Advisory Service, backed by all the resources of a world-wide organisation, is freely available with detailed information and expert advice on all questions concerning SKF products and their application.

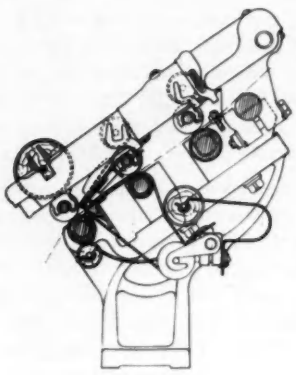
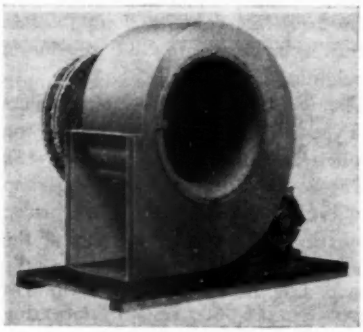


Fig. 16

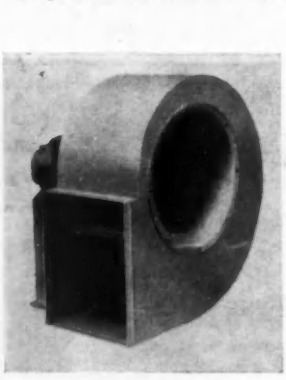
"QP" and "QM" Multivane Centrifugal Fans

THE first of two new fans announced by The Standard and Pochin Bros. Ltd., Leicester, is belt-driven and compactly combines fan, motor, and drive into a "packaged" unit attached to a wooden base for easy fixing. Known as the "QP," it embodies a forward curved multi-bladed impeller housed in a fabricated steel casing and mounted on a bearing assembly comprising two-ring lubricated sleeve bearings. The "QP" fan is driven by a squirrel cage electric motor rated at ½ b.h.p. at 1,440 r.p.m. (¾ b.h.p. for certain duties) and available for 400 - 440 volts, 3 phase, 50 cycles, or 200 - 250 volts, 1 phase, 50 cycles.

The other centrifugal fan unit, type "QM" has a forward curved aluminium impeller mounted on the extended shaft of a totally enclosed rheostat controlled,



"QP" belt-driven fan combines fan, motor and drive into a "packaged" unit



"QM" slow speed, low velocity fan

electric motor, available for either 346 - 440 volts, 3 phase, 50 cycles or 200 - 250 volts, 1 phase, 50 cycles. The motor is bolted to a fabricated steel stool from which a casing is overhung. The casing arrangement may be adjusted to vary discharge position. Available in three sizes, "QM" type slow speed units cover a large number of low velocity and low pressure duties.

In the design of these quiet running assemblies every effort has been made to restrict the noise level of all component parts to a minimum. The degree of quietness will, however, be influenced by features of the duct system and environment and the use of resilient mountings and flexible duct connections is strongly recommended by the makers.

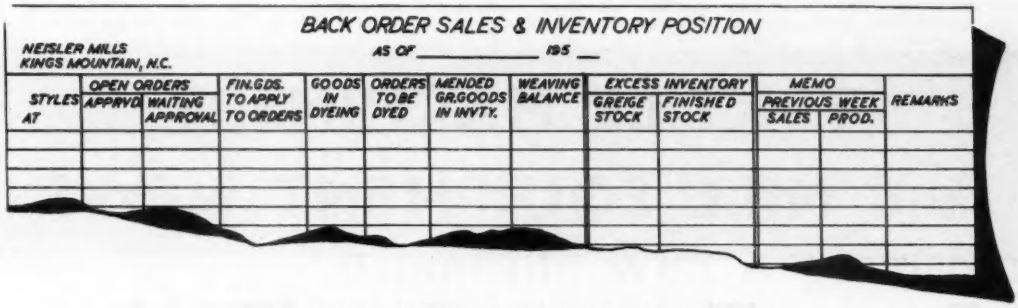
New Book

THE STRUTTS AND THE ARKWRIGHTS, 1758 - 1830; A STUDY OF THE EARLY FACTORY SYSTEM. R. S. Fitton and A. P. Wadsworth. Manchester University Press, 316-324 Oxford Road, Manchester 13 (price 35s.).

This study embraces far more than is suggested by its title and sub-title and is, in fact, a most noteworthy contribution to the wider fields of social and economic history. Its preparation and publication owe much to the English Sewing Cotton Co., who not only lent hitherto unexamined business records but also provided financial assistance. Of the authors, Mr. Wadsworth's researches into the history of the textile industry are well known and Dr. Fitton has proved a worthy collaborator.

The main characters are Richard Arkwright, an ebullient personality, Jedediah Strutt, a more restrained and introspective figure and his son, William Strutt, F.R.S., a mechanical genius and builder of the first multi-storied fire-resistant buildings. The fact that more personal records are available than are business records has proved to be no bad thing as from letters very fully reproduced a reasonably clear picture is presented of the industrialist of the formative years of the textile factory system. A particularly full account is given of the life and work of Jedediah Strutt, inventor of the Derby rib machine and Arkwright's partner in the Nottingham and Cromford mills. Less is known of Arkwright's private life but from many sources it has been possible to delinate his character. The story of his struggles with the Lancashire cotton manufacturers and his lengthy patent litigation is well told. A most interesting description of the organisation and work of the mills is given in Part 2 and includes chapters on sources of supply of raw materials and products and markets. Labour management appears to have been humane and considerate, indeed patriarchal in many respects. The appendices contain genealogical tables, letters illustrating the domestic life of the period and several statistical tables.

The authors' sources of information are listed in a very full bibliography. S.P.S.



BACK ORDER SALES & INVENTORY POSITION

NEISLER MILLS
KINGS MOUNTAIN, N.C.

AS OF _____ 195 __

STYLES AT	OPEN ORDERS APPRVD.	OPEN ORDERS WAITING APPROVAL	FIN. GDS. TO APPLY TO ORDERS	GOODS IN DYEING	ORDERS TO BE DYED	MENDED GR. GOODS IN INVTY.	WEAVING BALANCE	EXCESS INVENTORY GREIGE STOCK	EXCESS INVENTORY FINISHED STOCK	MEMO PREVIOUS WEEK SALES	MEMO PREVIOUS WEEK PROD.	REMARKS

Fig. 1. This is compiled from a "card ledger record" on each style

Back Order Sales and Inventory Position

Excess inventory indicates lack of co-operation between sales, order and production departments.

By F. H. DREWES

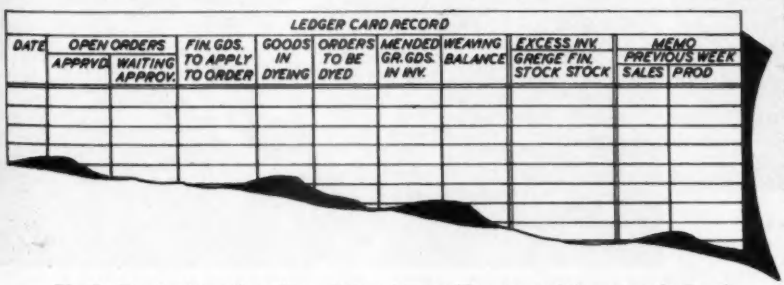
PROBABLY one of the most exasperating situations which does arise in the textile industry is in the handling, scheduling and expediting of orders for greige goods and finished cloth whereby excess inventories persist in building up despite the all-out efforts of management. This condition is brought about by the open order position and the failure to stop weaving production when order requirements have been met—taking into consideration any previously established or built-up excess inventory.

To overcome this problem in one large mill in the U.S.A. it was found necessary to revamp the entire procedure through the origination and follow-through of a weekly report called "Back Order Sales and Inventory Position"—Fig. 1. This report in several pages is compiled from a "Card Ledger Record" on each style—Fig. 2—on which the day-to-day order, sales and inventory position are posted, summarised and transferred weekly on to the report form—Fig. 1.

As evidenced from the uniform captions on both ledger card and report form, the individual styles by names and/or numbers are listed. The approved or "firm" orders are entered by numbers of pieces and the orders awaiting customers' release instructions and credit approval by the credit department or factor immediately follow. The next five columns are of the utmost importance and enables the order analysis and scheduling departments to determine when production and completed status has been reached to enable expediting of firm orders. The information under "Excess Inventory" is important from the standpoint that production should not normally have extended beyond order requirements. A large excess inventory is indicative of a lack of co-operation between sales, order and production departments.

The "memo." columns as indicated are historical in nature and serve only as statistical information. The last column "remarks" is used to indicate how many days a loom is scheduled to run to meet order requirements, taking into consideration excess inventory on which every effort should be made to eliminate. This information is passed along to the production department. Through this means of close inventory control it is possible to reduce finished cloth inventory and conserve warehouse space.

Each style is reported upon weekly. The first completed report covered eight pages and 123 styles and reported first quality only. In these trying times, it is not enough that all employed in textiles be sales-minded—everyone should strive to be economy-minded, in an effort to control inventory position, realising that an accumulated inventory results in tying up of capital investment. The proper handling and expediting of a large number of orders resulting in a small inventory value of any unsold finished product is an accomplishment to be desired and worth striving for in every type of manufacturing business.



LEDGER CARD RECORD

DATE	OPEN ORDERS APPRVD.	OPEN ORDERS WAITING APPROV.	FIN. GDS. TO APPLY TO ORDER	GOODS IN DYEING	ORDERS TO BE DYED	MENDED GR. GDS. IN INV.	WEAVING BALANCE	EXCESS INV. GREIGE STOCK	EXCESS INV. FIN. STOCK	MEMO PREVIOUS WEEK SALES	MEMO PREVIOUS WEEK PROD

Fig. 2. Day-to-day order sales and inventory position are posted, summarised and transferred weekly on to Fig. 1

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

Rotary Traverse Cone Winders

Mechanical and operating features of a rotary traverse automatic travelling spindle cone winder and a conventional type machine designed in connection with larger spinning packages

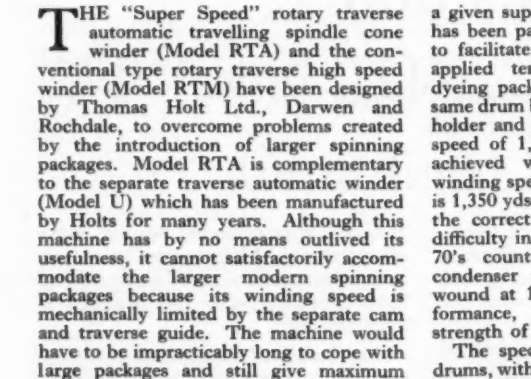
THE "Super Speed" rotary traverse automatic travelling spindle cone winder (Model RTA) and the conventional type rotary traverse high speed winder (Model RTM) have been designed by Thomas Holt Ltd., Darwen and Rochdale, to overcome problems created by the introduction of larger spinning packages. Model RTA is complementary to the separate traverse automatic winder (Model U) which has been manufactured by Holts for many years. Although this machine has by no means outlived its usefulness, it cannot satisfactorily accommodate the larger modern spinning packages because its winding speed is mechanically limited by the separate cam and traverse guide. The machine would have to be impracticably long to cope with large packages and still give maximum operative efficiency.

Holts claim to have solved this problem with a specially designed rotary traverse drum which permits much higher winding speeds so that fewer units are required for a given supply package. Special attention has been paid to the contour of the track to facilitate winding with a minimum of applied tension. Hosiery, warping or dyeing packages can be produced on the same drum by simply changing the package holder and arm. Although a test winding speed of 1,800 yds./min. is said to have achieved with the RTA, the normal winding speed for warping or hosiery cone is 1,350 yds./min. With supply bobbins of the correct form and build there is no difficulty in winding warp yarns of 10's to 70's counts at 1,350 this speed and condenser yarns have been successfully wound at 1,000 yds./min., although performance, of course, depends on the strength of these short staple yarns.

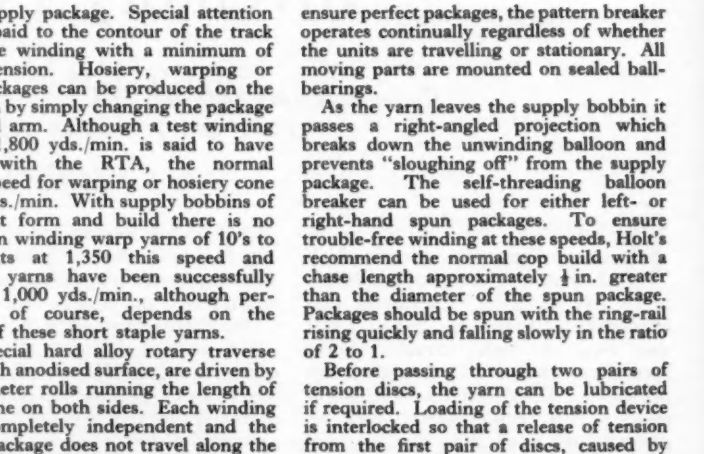
The special hard alloy rotary traverse drums, with anodised surface, are driven by large diameter rolls running the length of the machine on both sides. Each winding unit is completely independent and the winding package does not travel along the driving roll as in previous models. To ensure perfect packages, the pattern breaker operates continually regardless of whether the units are travelling or stationary. All moving parts are mounted on sealed ball-bearings.

As the yarn leaves the supply bobbin it passes a right-angled projection which breaks down the unwinding balloon and prevents "sloughing off" from the supply package. The self-threading balloon breaker can be used for either left- or right-hand spun packages. To ensure trouble-free winding at these speeds, Holt's recommend the normal cop build with a chase length approximately ½ in. greater than the diameter of the spun package. Packages should be spun with the ring-rail rising quickly and falling slowly in the ratio of 2 to 1.

Before passing through two pairs of tension discs, the yarn can be lubricated if required. Loading of the tension device is interlocked so that a release of tension from the first pair of discs, caused by irregularity in the yarn, is compensated by



Rotary traverse high speed winder (Model R.T.M.)



Holt's "Superspeed" rotary traverse automatic travelling cone winder (Model R.T.A.)

an increase of tension from the second pair. The result is an approximate balance of tension and a considerable steadying effect on the yarn.

The trap type yarn clearer can be quickly adjusted by a special key and gauge; the machine may be fitted with a fisherman's knotter or Holt's patent "Minifast" which ties a knot of only three yarn diameters.

Model RTA is fully automatic, the operative's only function being to feed supply packages and doff the wound cones. In cone winding, the correct formation of the package is predetermined by the special construction of the carrying arm and fulcrum and no adjustments are necessary. Holt's recommend paper centres for the package. The main drive to the machine can be by single-speed, two-speed or variable-speed motor. Drive to the traverse of the winding units is by two-speed motor and variable-speed cone pulleys giving 20 to 25 units/min. on full speed and 10 to 12·5 units/min. on half speed. The lower rate is excellent for doffing wound packages although doffing has been successfully carried out at full speed.

Model RTM Superspeed rotary traverse winder shares many of the outstanding features which characterise the automatic machine, including the rotary traverse drum, pattern breaker and balloon breaker. Holt's "inverted peg" disc tension device, of the self-threading self-cleaning type, is fitted as standard. Another standard feature is the new slub trap clearer, which can only be adjusted by a special key and is arranged so that unauthorised interference causes the thread gap to close.

Holt's have made a careful study of the work done in feeding bobbins and piecing-up, and their findings have influenced the development of the winding unit for the RTM. Positioning of supply package, automatic threading arrangement for tension, clearer, stop motion wire and thread guide, location of the starting lever and new non-delay starting mechanism—are all features which make possible considerable economies in the utilisation of labour.

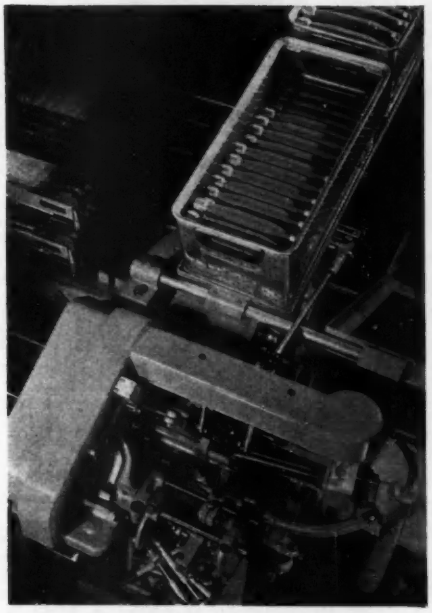
A new stepless variable speed headstock allows speeds to be adjusted in accordance with yarn quality and facilitates the economical allotment of spindles to operators according to the length of the supply package. The broken-end stop motion is operative for the finest threads and minimum tensions. Final lifting of the package from the winding roll is power operated instead of by springs or weighted levers. Diameter stop motion can be supplied if required.

Certain modifications to the standard RTM are available for the production of packages for dyeing or bleaching which should have a lower density equal along the body and at the ends of the package. These include an adjustable oscillating motion to the traverse winding drum shaft and a special balancing arrangement to the package assembly. The oscillating motion to the winding drum shaft produces variance in the position of the yarn traverse on the package, thus spreading the area of the yarn reversals at the end and producing a density at these points equal to the density of the body of the package. The balancing arrangement of the package assembly ensures that the predetermined pressure of the package on the winding roll is substantially constant from beginning to end of the package build-up, creating uniform density throughout. A take-off drive enclosed in the headstock, is used for driving an empty bobbin conveyor which may be situated within easy reach of the operator close to the supply package spindle. An anti-ribbon device is incorporated to prevent pattern winding.

New Development in Automatic Weft Replenishment

AT the forthcoming exhibition in Milan, George Fischer Ltd., Schaffausen, Switzerland, will show their latest +GF+ ALV automatic pirn loader working on two single shuttle cotton looms. This new improvement is claimed to improve efficiency and the quality of the cloth, at the same time solving transport problems from the winding room to the weaving shed. As will be observed from the photograph the pirns, provided with a nose bunch, are moved by gravity from large pirn containers to their preparation and change position The transfer of the pirn into the shuttle is completed in the normal way. All preparatory operations of the pirn for the next change are controlled pneumatically.

During preparation, the nose bunch of the pirn is stripped by a pair of strippers, passes into a suction nozzle and the end of the weft is clamped. The ends of both the old and the new pirn are now positioned in the same manner as on the conventional pirn changer. A special temple cutter combined with the suction nozzles ensures the complete elimination of lashing-in. As the mechanism for the preparation of the pirn is controlled by the hammer movement of the last transfer, the preparation can be effected unhurriedly.



Nylon Staple for Topmaking

B.N.S. deliver nylon staple in press-packed, steel-banded bales of between 300 and 400 lb. each. Combing lots should be limited to a maximum weight of 12,500 lb. Each lot should be stack-blended before use.

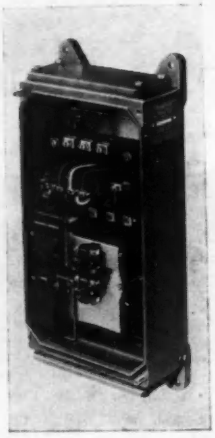
As an aid to blending, each bale of staple is marked with a single or double letter after its number, e.g. A or AA or BB, etc.* These letters, known as week-letters, denote the period during which the staple was manufactured. No one delivery of staple will normally consist of bales bearing more than four different week-letters, and each week-letter component will represent not less than one-fifth of the total weight of the delivery. The blending of a combing lot consists of blending together the different week-letter components in the delivery.

Segregation of Top Lots.—Each delivery of staple should be made into a separate lot of tops and segregated from other lots. Top lots should not be mixed unless authorisation has been given by a customer who is satisfied that such mixing will not be detrimental to the quality of his product.

Segregation of Spinning Lots.—Each lot of top should form a separate spinning run. Mixing of top lots during spinning should be strictly avoided, and spinning runs should be segregated to avoid indiscriminate mixing of yarn during subsequent fabrication. Spinners are, of course, quite at liberty to mix top lots and spinning runs if they have checked that the fabrics to be made from those yarn will be of the desired quality. British Nylon Spinners are unable to accept the responsibility for any faults arising from mixing.

* *On occasions, week-letters may also carry numeral suffixes (e.g. BB_1 and BB_2); such should count as two separate week-letters.*

Heavy Duty Contactor-Starters



Type J-60 direct-on-starter with cover removed

UNDER the designation of Type J-60, J. A. Crabtree and Co. Ltd., Lincoln Works, Walsall, Staffs., have introduced a new group of heavy-duty contactor-starters designed to give long operational life. Used as a contactor on a.c. supplies of 415 volts 50 cycles, the J-60 has a rating of 100 amp. per phase for heating loads and 60 amp. per phase for inductive loads. On standard 415 volt supply the direct-on starters are suitable for motors of up to 40 h.p. and the auto. star-delta starters for motors of up to 70 h.p.

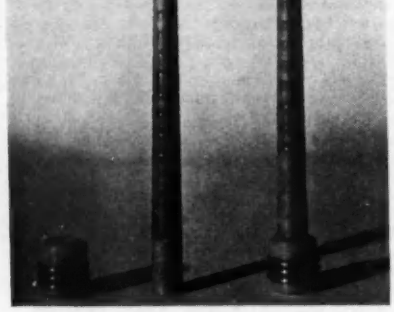
In common with all Crabtree control gear, the J-60 range has been developed from a small number of standarised and interchangeable units mounted on single- or two-unit backplates to give a wide choice of control. The same backplates will also accommodate built-in isolating switches and H.B.C. fuses. Single-unit cast aluminium cases are employed for direct-on contactors and starters and for separate isolating switches with or without fuses. Two-unit cases are used for direct-on starters with isolating switches and for reversing starters without isolating switches. Sheet steel cases are supplied for assemblies consisting of more than two units—such as star-delta starters, reversing starters with isolating switches or pole-changing starters. All enclosures are provided with gasketed covers or doors and are finished in quaker grey enamel.

The Type J-60 automatic star-delta starter with isolating switch and H.B.C. fuses with the panel door removed

New Dutch Weft Bobbin

A WEFT bobbin for use in spinning mills, developed by the Dutch firm of Van Katwijk's Papier en Cartonverwerkende Industrieen N.V., of Aalten, Gelderland, Holland, consists of a shank, which is wound of 100% cellulose paper and then impregnated on a synthetic resin basis, and a foot on which metal rings are mounted and which is made of wear-resistant plastic.

One advantage claimed for this design is that the shank is exchangeable and the plastic foot can be used again. This is made possible by the cone shape of the paper body of the shank which can be pressed to fit into a similarly shaped hole in the plastic foot. Another advantage claimed for the new bobbin is its stability. It does not splinter nor crack, nor does it warp when subjected to intensive moistening and drying. It is said to have a perfect permanent fit and to give a true vibration-free rotation.



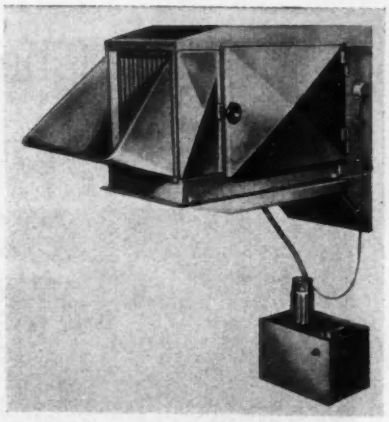
The new Dutch weft bobbin is made up of a shank and foot, the latter being re-usable

New Type Fablothene Packs

AT the Plymouth works of Berker Sportcraft Ltd., where Berkertex garments are produced at the rate of one every 20 secs., all finished garments are being sheathed in polyethylene before despatch to retail outlets.

Using an E-Z "Twin Imperial" bagging machine, which cuts the film to the required length and heat seals it above the hanger supplied with each garment, the operator can pack 1,600 finished garments a day. The 60-gauge Fablothene high-clarity film used in this work is produced, and printed as required, by Anglo-American Plastics Ltd. (a member of the Commercial Plastics group of companies) from polyethylene compounds supplied by Bakelite Ltd. The E-Z "Twin Imperial" machine is manufactured in the U.K. by Lister Bros. Ltd., Woolwich, London.

Wall-Mounted Aerosol-Turbo Air Conditioning Unit

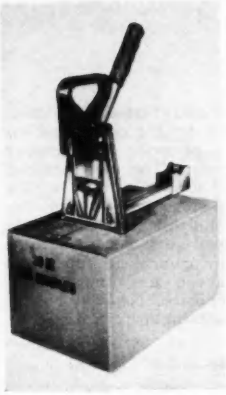


THE Model 1500 Aerosol-Turbo air conditioning unit is wall mounted and supplies recirculated or fresh air into the environment at 1,500 c.fm. Into this airstream is introduced the flow of minute aerosols by which the machine achieves accurate control of the atmospheric conditions. Recent adaptations to this model have ensured that it is flameproof for group 2 and group 3 gases. This is an important development of great interest to manufacturers whose processing involves conditions of fire risk, either through the use or production of inflammable gases and/or the generation of static electricity. The machine will be of particular interest, for instance, to printers using volatile inks on high speed presses.

Aerosol-Turbo model 1500 is designed to maintain an overall even humidity for a volume of up to 50,000 c.f. Working in conjunction with a humidistat, the machine is fully automatic and will maintain a preset degree of humidity within ± 2%. The unit is self-cleaning and the only maintenance likely to be required is the occasional cleaning or replacement of the filter in the reservoir tank. All working parts are made of stainless steel or special aluminium alloy. Further details gladly supplied by

P. M. Walker and Co. (Halifax) Ltd., Hopwood Lane, Halifax.

New Packaging and Stapling Techniques



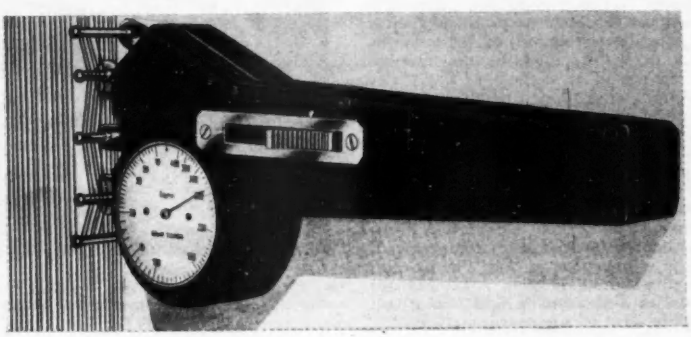
The Model S.H.D.

The Model M machine

WITH a new range of stapling machines available from Industrial Stapling and Packaging Ltd., 7 - 9 Rathbone Street, London, W.1, a minimum number of staples is used—only four "king" size staples being needed along the centre seam of the carton to seal top or bottom. Model M is a manually-operated machine, primarily for top sealing of already filled cartons. It can also be used for bottom sealing of empty cartons from the outside by placing two rods in the form of a cross beneath the open flaps and then closing the flaps before stapling.

Models are made for three different sizes of staples with penetrations from ½ in. to ⅞ in. to allow for different thicknesses and qualities of board; each will hold just over 100 staples. Overall height of machine is 11½ ins., length is 1 ft. and width 5½ ins. It is made of stainless steel, and has a red plastic handle with a red anodised nosepiece. Another model, known as SHD, is similar to Model M but of heavier construction. It has similar dimensions except that the overall height is 1 ft. 1 in.; there is also a carrying handle in place of the nosepiece. Both models are fitted with an adjustable anvil so that they can be used with varying thicknesses of flute in corrugated board.

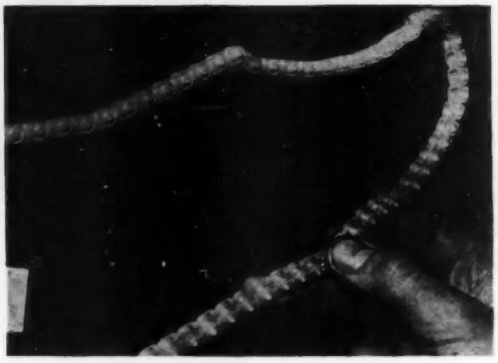
Direct Reading Tension Gauges



A COMPLETELY new range of tension gauges especially adapted for the measurement of tension threads and yarns in motion has recently been introduced by the German firm Schmidt (Esslingen), whose sole representative in the United Kingdom and Commonwealth is Addison Electric Co. Ltd., Bosworth Road, London, W.10. The gauges incorporate direct reading precision dial gauges, calibrated in grams.

Warp thread tension gauges are made in three different models covering the measuring ranges 5 - 100, 20 - 300 and 100 - 1,000 grams respectively. Thread tension gauges for low tensions are made in seven models covering a total range of 0·3 to 120 grams, and yarn tension gauges with hard chromium plated ball bearing mounted rollers cover the range from 3 to 10,000 grams with nine different models.

Nylon Chain for Light-Weight Drives



Nylon chain is said to have considerable scope where continuous or rapidly intermittent operations are involved

ALREADY on the active list of important defence projects, nylon chain is now being offered by George Goodman Ltd., Robin Hood Lane, Birmingham 28, to industry for light positive drive applications where its unique properties offer new and stimulating design opportunities. Qualities of outstanding appeal are: (*a*) low inertia, (*b*) requires no lubrication, (*c*) noiseless in operation, (*d*) non-magnetic, (*e*) good electrical insulating properties, (*f*) high resistance to chemical attack, and (*g*) exceptional abrasion and wear resistance. Nylon chain offers considerable scope not only in the rapidly expanding electronics field but also in many other branches of industry. The chain is offered in 8 mm. pitch only, and will sustain a static load of 5 lbs. For continuous or rapidly intermittent operations giving rise to pulsating loads it is recommended that the driving load should not exceed 3 lbs. It is intended to add other sizes of nylon chain to the range as demand becomes known. In the meantime, we shall be delighted to receive enquiries from designers, technicians and manufacturers, and will gladly submit designs and full technical data against specific details.

New Applicator for Molybdenum Disulphide Paste

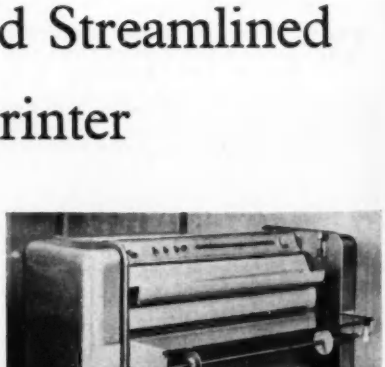
TWO new features are embodied in the new general purpose paste 100 applicator tubes marketed by K. S. Paul (Molybdenum Disulphide) Ltd., Great Western Trading Estate, Park Royal Road, London, N.W.10. Moly-Paul general purpose paste 100 covers not only the usual anti-scuffing and anti-seizing applications (bearing capacity in excess of 500,000 p.s.i.), but is also suitable as a running-in paste and first-aid material, and a tapping and drilling compound for stainless steels, phenolic and other "difficult" materials. The new general purpose paste 100 tubes are fitted with a special applicator sponge facilitating the rubbing of the molybdenum disulphide paste into the metal surfaces direct from the tubes—thereby gaining in functional effectiveness and at the same time avoiding waste and inconvenience. No extra charge is made for the new applicator tubes.

The new tube contains a special sponge (bottom left) which facilitates paste application

Extremely Rapid Streamlined Photoprinter

A DISTINCTIVE feature in the new "Zephyr" photoprinter designed and manufactured by Nig Manufacturing Co., 3 - 9 Dane Street, Holborn, London, W.C.1, is its wind-tunnel "Cyclonic" developer. This ingenious invention enables the machine to produce a clear print in under six seconds or, for example, 2,500 entirely different full-scale engineering drawings in an eight-hour day. The "Cyclone" wind-tunnel principle causes vapourised ammonia to be blown at high speed and at pressure directly on to the entire unobstructed surface of the print. This process does away with the perforated metal plate or roller tank ammonia systems.

Thus, the Nig "Zephyr" is claimed to be the first machine that guarantee 100% surface development of prints at high speed, also prints that never sticks. The printer, although weighing 11 cwts. is as neat and compact as a modern upright piano, and a pleasing asset to any drawing office.



The "Zephyr," utilising the "Cyclonic" developer, is said to be able to print 2,500 different drawings in a day

THE TEXTILE
COLOURIST & FINISHER

Heat Treatments: A Significant Feature of Modern Textile Finishing

There can be little doubt that even greater advantage will be taken in the future of the possibilities of improving the properties of all fibres by employing appropriate high temperature treatments

By B. C. M. DORSET

THE high temperature treatment of fabrics and garments for the purpose of making them more serviceable by modifying their fibre properties in some particular direction is something of an innovation in the processing of textile materials. In past years the application of heat to such materials has been mainly for the purpose of drying wet goods or for giving some added degree of plasticity so that the effect of pressure treatments can be made more effective. Today, and more particularly because of the availability and use of new fibres having enhanced thermoplastic properties, much more can be done to modify these properties by the application of heat than has hitherto been possible. A review of some of the more recent developments in this field might therefore be useful.

Cellulose acetate fibres, both those made from secondary acetate having a 53 to 54% acetyl content and those made from triacetate with the higher 60 to 61% acetyl content, are thermoplastic and therefore amenable to modification by treatment at a high temperature. The triacetate fibres are especially amenable to heat treatments which are technically useful and this is a property which is held out to extol the importance of such triacetate fibres as "Tricel" and "Arnel" for textile purposes. It is, for example, an advantage of "Tricel" (British Celanese Ltd. trade name for their cellulose triacetate fibres) materials that these can be readily given durable pleats so as to withstand a reasonable amount of washing. A heat treatment of dyed "Tricel" can also serve to improve its colour fastness to washing.

An important property of cellulose acetate fibres is their stability to hot ironing. While cotton, linen, and regenerated cellulose fibres such as viscose rayon can be safely hot ironed up to 240°C. it is generally not advised to iron acetate fibre materials above 170 to 180°C. for they then commence to soften, shrink, and acquire a firmer handle due to increased fibre adhesion. It is obviously desirable to have available some treatment for raising the safe ironing temperature of acetate fibres.

Ironing Temperatures

It has been found that the safe ironing temperature is not materially dependent on the chemical composition of an acetate fibre so that there is not much difference between secondary and triacetate fibres in this respect. But an important discovery has been made that by a suitable high temperature treatment the physical structure of triacetate fibres particularly can be changed to result in an appreciable raising of their safe ironing temperature. Thus whereas it is recommended to avoid exceeding 170 to 180°C. in the hot ironing of triacetate fibre fabrics it is permissible to iron at 220-230°C. approx. if the fabric has been especially heat-treated to give it the required additional stability.

Before describing particular heat treatments which can thus improve acetate fibre goods it will be useful to indicate how such treatments can become effective. Each fibre is known to contain crystalline and non-crystalline regions as shown in Fig. 1 and it is to be particularly noted that in the non-crystalline regions where the molecules are less regularly arranged in relation to each other there is a wider lateral spacing of these molecules than exists in the crystalline regions where the molecules are more regularly arranged and, in particular, are more parallel to each other. It is generally recognised that in a fibre the forces which hold the long chain molecules together laterally (these forces will normally be due to chemical attraction and Van de Waals forces and are quite apart from any cross-linking by chains of carbon atoms) are greater as the molecules are closer together. The lateral holding-together of the fibre molecules will thus be considerably greater in the crystalline than in the non-crystalline regions.

Under some circumstances a fibre will show a tendency to become more crystalline but it cannot undergo this change without movement of the fibre molecules—a movement to take up new positions as demanded by the increase of crystallinity. Such movement will be opposed by these forces holding the molecules together later-

ally and so for an increase of crystallinity to take place there must be a temporary loosening of the lateral forces described above. This loosening is promoted by the application of heat to the fibre for it is generally believed that as a substance is heated so are the molecules brought into some kind of vibratory motion in which there can be a to-and-fro movement of these molecules relative to some mean position. So in the case of cellulose triacetate fibres it is possible by heating them to a temperature approaching but not actually attaining their melting point (at this latter temperature the lateral forces are sufficiently weakened to allow too great a movement of the molecules such that these can then take up a random distribution quite opposed to the crystalline state) to allow the fibre molecules to move relatively to each other and thus allow

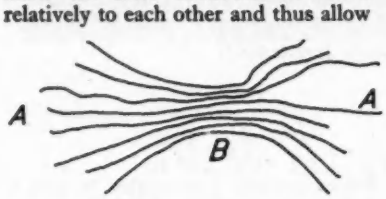


Fig. 1. Packing of long chain molecules within a fibre, showing the amorphous regions (A) and the crystalline regions (B). It is to be noted that the molecules are closer to each other in the crystalline regions

a greater degree of crystallinity within the fibre to be attained. It is indeed a fact that by dry heating triacetate fibres to a temperature preferably within the limits of 185 - 220°C. for but a few seconds the degree of crystallinity of the fibre can be sufficiently increased to give the treated fibre valuable new properties which includes a new higher safe ironing temperature, sometimes up to 235 - 240°C. To some degree these changed properties are influenced by the manner in which the cellulose triacetate has been formed.

A useful way of measuring the heat sensitivity of a cellulose acetate material is to stand on it a heated iron and note the minimum time before which the fabric sticks to the metal surface; the temperature is generally referred to as the "sticking temperature" and it is somewhat above the safe ironing temperature. X-ray diagrams of the untreated and heat-treated cellulose triacetate fibres clearly reveal the increase of crystallinity produced but this is also revealed by the lowered capacity of the fibres to absorb dyes and moisture.

Time and Temperature

So far mention has only been made of a dry heat treatment but it is possible to adopt a wet (hot water under pressure) or a moist steam treatment and produce similar beneficial effects. Thus, according to B.P. 758,442 much the same improvement of the safe ironing and sticking temperatures as noted above can be effected by heating the cellulose triacetate fibres in steam or hot water at 125 to 150°C. It will be generally recognised that in either dry or wet heating the conditions required for the required change in fibre crystallinity to take place are governed by two main factors—time and temperature. The higher is the temperature employed the shorter may be the time. Thus for a dry heating at 185°C. it is necessary to allow a treatment time of 10 mins. or more whereas at 190°C. and 220°C. the corresponding times will be 5 mins. and 15 secs. respectively. With wet steam or hot water a time of 1 to 2 mins. will be required at 120°C. whereas at 160°C. the time can be reduced to 5 secs.

It is interesting to note how a wet heating is more effective than a dry heating in so far as it allows the treatment to be carried out at lower temperatures and within a shorter period but the same useful changes in the safe ironing temperatures are obtainable by either method of heating. Dry heating can be more easily carried out since it may involve simple passage of the triacetate fabric over a number of hot rotating cylinders or over a stentering machine where hot air can be blown upon the fabric as it moves forward. For a steaming treatment it will generally be necessary to use some form of closed apparatus as for example an autoclave within which can be placed the fabric in rolled form (say on a perforated tube through which steam can be passed). There is an alternative form of treatment in which the triacetate fabric in openwidth is led through a bath of molten Wood's metal as in the Standfast molten metal dyeing machine.

It has been mentioned above that the effect of the high temperature treatment is essentially to increase the degree of crystallinity within the triacetate fibres and that this change can be followed by observing the change in the X-ray diagrams of the fibres. An alternative but indirect method for following the effect of the heating and also the change of crystallinity is to observe the reduced dye pick-up of the fibres under standardised conditions. In Fig. 2 are shown the dye absorptions (for the disperse dye Eastone Fast Red GLF) of ordinary secondary acetate fibres and "Tricel" and also the latter after a heat treatment in steam and under dry conditions (in a pressure steamer for one half-hour at 125°C. and on a stenter at 220°C. for 20 secs. respectively). Of these particular treatments the dry heating appears to be somewhat more effective but the curves very clearly indicate how the dyeing power of the fibres is much reduced by the heat treatment.

In the course of such heat treatment the triacetate fibres tend to shrink somewhat but only to a small degree, say 1 to 3%. This contraction can be prevented without detriment to the results required of the heat treatment by holding the yarn or fabric under a suitable degree of tension or it may be allowed to take place. On the whole, a softer handle will be obtained in the triacetate fabric if a degree of shrinkage is allowed. But whatever the shrinkage allowed the heat treatment has the useful effect of stabilising the fibres for after such heat treatment a yarn or fabric will be much less subject to shrinkage as a result of exposure to high temperatures than it formerly would. Perhaps these beneficial results of a heat treatment can be best illustrated by reference to a particular example as indicated below.

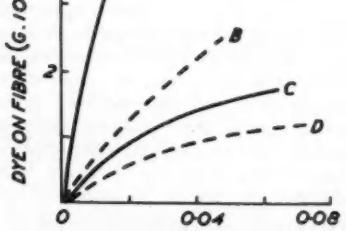


Fig. 2. Curves for (A) secondary cellulose acetate (B) ordinary triacetate (C) steam-heated triacetate and (D) dry heated triacetate fibres showing their relative pick-ups when dyed with Eastone Fast Red G.L.F.

The triacetate yarn used consisted of filaments each having a denier of 2·4, a tenacity of 2·49 g./den., and an extensibility at break of 25·2%. Fabric made from this yarn had a safe ironing temperature of about 180°C. and a sticking temperature of 200°C. One hank of the yarn (*A*) was exposed to a current of air at 180°C. for 10 mins. while another (*B*) was similarly exposed at 190 to 200°C. for 5 mins. and

in each case the yarn was free to shrink. Tests then showed that yarn (*A*) had a tenacity of 2·89 g./den. and an extensibility of 23·8% while yarn (*B*) had an unchanged tenacity but the reduced extensibility of 10·5%. The shrinkages produced in yarns (*A*) and (*B*) by the heat treatments were 1 - 2% and 2 - 3% respectively. When these yarns were woven into fabrics these had the same safe ironing temperature of about 235°C. thus having hot ironing properties comparable to those of cotton and linen.

The improved heat stability of the treated yarns is further indicated by shrinkage tests in which heat-treated yarn (*B*) was heated for 1 min. at 235°C. In this treatment the yarn suffered no material change in its tenacity and extensibility which remained at 2·53 g./den. and 10·3% respectively while it did not shrink in length. Under comparable high temperature heating the original untreated triacetate yarn shrank 23% in length while its tenacity fell to 0·95 g./den. and its extensibility at break fell to 5·0%. But heating is not the only method which can be adopted for sufficiently loosening the fibre structure so that the molecules can move into positions which give the fibre a higher degree of crystallinity. There is the alternative method of treating the triacetate fibres with a liquid having the power to swell the fibres but not to dissolve them.

There are many swelling agents for triaceate fibres and they differ widely as regards the temperature and other conditions at which they become effective. But according to B.P. 776,346 those which are most convenient to use and which give the increased fibre crystallinity necessary to raise the safe ironing temperature to a useful degree are the normally liquid aromatic hydrocarbons, normally liquid alkyl halides of boiling point above 50°C., 30 to 70% aqueous solutions of acetone, and mixtures of acetone and a lower mono-hydric alcohol containing 20 to 70% of acetone. Specific examples of these swelling agents are benzene, toluene, and the xylenes, and propyl bromide, which are all best used at 60 to 90°C. The acetone solutions and mixtures can also be used at the lower temperatures of 15 to 40°C. Again the time of treatment is an important factor. Thus when using boiling benzene the full effect requires a treatment of 3 to 7 hours although a worthwhile improvement of the safe ironing temperature can be obtained within 1¼ to 2¼ hours. When it is desired to work more rapidly and at room temperatures the acetone-water and acetone-alcohol mixtures are very useful—a useful improvement can be obtained by treating the triacetate fibres at 20°C. for 5 to 30 mins. In all such treatments there is involved a shrinkage of up to 3% which is about the same as that involved in dry and wet heating treatments previously described.

It has been found that by immersing triacetate fabric for 6 hours in boiling benzene that its safe ironing temperature is raised from about 170 to 230°C. If the treatment is shortened to but 2 hours then the new safe ironing temperature is about 210°C. Two other effects or improvements are simultaneously obtained with the raising of the safe ironing temperature. They are that the fibres are made more resistant to shrinkage during exposure to high temperatures and they are made more resistant to "creep" while held in hot water under a stretching force. This can be illustrated by reference to a treatment of the triacetate fabric with aqueous acetone. Some of the fabric was treated for 20 mins. at 20°C. with a 50/50 mixture of acetone and water so that its safe ironing temperature was raised to 210°C. Much the same result could have been obtained by a similar treatment with a 40/60 mixture of acetone and ethyl alcohol. When the treated fabric was held under tension in water at 80°C. it slowly extended to only 80% of the amount by which the untreated fabric extended under similar conditions.

Strength and Handle

An interesting point is that during the treatment of triacetate fabrics in boiling benzene the increase of safe ironing temperature is accompanied in the early stages by an increase in strength. It is only if the treatment is prolonged to secure the maximum increase in the safe ironing temperature that the strength then commences to fall so that ultimately the fabric is left with its original strength. Thus in holding yarn immersed in boiling benzene for 4 hours only (the safe ironing temperature is raised to at least 210°C. but somewhat below the maximum of 230°C. capable of being attained) the fabric at this point has a tenacity of 3·16 g./den. as compared with its original tenacity of only 1·84 g./den.—the corresponding extensibilities are 18·9 and 25·2% respectively.

It has been observed that fabrics made of triacetate fibres and in certain weaving constructions have a somewhat thin papery handle and that it is not possible to change this to a more mellow and soft handle by simply subjecting the fabric to scouring and hot soaping treatments such as might be expected to open-up the fabric structure and confer a lofty handle. If such fabric is subjected to the high temperature treatments described above for raising the safe ironing temperature and then well washed allowing ample opportunity in this last processing for fabric shrinkage (if any is likely to occur) no softening is obtained. But it has been discovered (B.P. 795,821) that by applying a fibre-swelling treatment so as to ensure a fair degree of area shrinkage before the high temperature treatment it is possible to secure a fabric characterised by consisting of fibres having an enhanced degree of crystallinity and a corresponding higher safe ironing temperature and yet having a very soft full handle such as is generally desirable. The necessary shrinkage is obtained if the fibre-swelling agent employed consists of an aqueous 52% solution of acetic acid or an aqueous 55% solution of acetone but other substances can be used and they will generally be of a type which in concentrated form have the power to dissolve or swell very considerably the triacetate fibres so that for use they have to be suitably diluted to give only that lower degree of swelling which is useful. Formic acid, ethyl lactate, glycol-mono-ethyl-ether, and glycol-mono-acetate are substances of this kind. The following illustrates the type of treatment which yields triacetate fabric having a high safe ironing temperature coupled with a pleasing soft handle.

Triacetate woven fabric is first scoured for 1 hour at 85°C. in a soap liquor containing 5 g. of soap per litre and is then hydroextracted and dried in a slack condition as for example with the aid of a festoon drying apparatus or on an "air-lay" drier. It is then led through a bath of 52% acetic acid at 20°C. so as to be immersed in this acid for 3 mins. while substantially free from tension; it is thereafter dried free from tension and it will then be found to have shrunk about 15% in the warp and 9% in the weft. The fabric is then led over a hot air stenter set to approximately the width of the slack-dried fabric and is subjected to air at 216°C. The fabric should be over-fed to the stenter so as to allow warp shrinkage. After such treatment the fabric may be dyed in the usual manner say with disperse dyes and is

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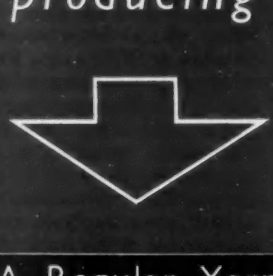

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finally re-stentered and decatised. Thus is obtained a triacetate fabric having excellent dimensional stability and a high safe ironing temperature yet characterised by a pleasing full handle quite different from that which would be obtained if the acetic acid shrinking treatment was omitted. The fabric in its final finished state will have suffered a warp shrinkage of about 12% and a weft shrinkage of about 5·5%.

From the above it will be evident that by a special heat treatment at a temperature not exceeding about 220°C. ordinary cellulose triacetate fibres may be given a "sticking" temperature of 220 to 240°C. with a corresponding high safe ironing temperature. It might be thought that such improvement might be the maximum that could be obtained with a fibre of this composition but such is not the case. By commencing with a triacetate yarn produced in a special manner as indicated below it is possible to raise the safe ironing temperature to 240°C. and also to produce triacetate fibre fabric having dimensional stability at temperatures as high as 285°C.

The special triacetate yarns are made by first producing yarn of a secondary cellulose acetate (54% acetyl content), then stretching this to about ten times its original length while plasticised by means of wet steam under pressure, and then further acetylating the resultant stretched yarn by treatment with a mixture of equal parts of benzene and acetic anhydride containing perchloric acid as a catalyst to convert the secondary cellulose acetate to cellulose triacetate—the yarn should be held stretched during this acetylation to avoid shrinkage. At this stage the highly oriented triacetate yarn is subjected to a temperature of about 280°C. for 1 min. (during the treatment the yarn will shrink only about 1%) and thus has its safe ironing temperature raised to 240°C.

Other effects produced by the high temperature treatment of triacetate fabrics include a lowering of the water of imbibition on wetting (from the normal 15% to about 12%), an increased durability of pleated effects, and a higher dimensional stability so that the fabric is less liable to shrink in hot washing treatments. Heat-treated triacetate fabrics also have superior crease resistance and if the fabric has been previously dyed it is likely that the colour will be made faster to washing. All these benefits appear to spring from increasing the crystallinity of the fibres. The increased fastness to washing of dyed triacetate fabric as produced by a high temperature treatment is shown by the curves in Fig. 3 (Mellow and Olpin; J. Soc. Dyers and Col., 1955, **71**, 817) which are based on a washing experiment in which the loss of SRA Fast Red VII was measured for secondary, ordinary triacetate, and heat-treated triacetate fabrics.

Nylon Hose

Heat treatments are also involved to a considerable degree in the dyeing and finishing of nylon goods. In the first place it is usually necessary to pre-set woven and knitted fabrics and other articles before wet processing so that in such processing cockling and irregular permanent creasing of the goods may be prevented. If for example, nylon hose are straightaway scoured and dyed as received from the knitting machines it will generally be found that the hose have shrunk and creased so as to be unsaleable. But by first drawing the freshly knitted hose on to suitable "shapes" and then steaming these under pressure their shape and dimensions are heat-set sufficiently to withstand subsequent wet processing provided that temperature conditions not more severe than those employed in the heat-setting are employed. But if the nylon yarn used in the weaving or knitting is of the artificially crimped type then in the final finished fabric or other article the crimp may have been partly or wholly removed so that much of the early desirable elasticity may be lost. To avoid this it is necessary to devise special heat treatments as part of the dyeing and finishing operations.

Artificially crimped nylon yarns may be produced in various ways all of which involve imparting to the yarn a particular form of distortion and then setting this distortion at a suitably high temperature. Either the yarn is twisted and then back-twisted or the yarn is mechanically impressed with a crimp while passing between fluted rollers. An interesting method for continuously introducing crimp into nylon yarn is described in B.P. 786,420 where use is made of a false-twisting device in combination with a heat-treatment which may comprise running the distorted or crimped yarn over a heated plate at 300 to 400°F. When such crimped yarn is employed for the production of hose and half-hose the following method of dyeing and finishing is recommended so that the dyed articles may be left with the higher degree of elasticity and stretch that is desired.

Assuming that the half-hose are knitted from a crimped nylon yarn prepared by a false-twist method and heat-set by the method described above and in which two such crimped threads of opposite initial twist are doubled together so as to produce a balanced yarn having the stability necessary for satisfactory knitting, these should first be drawn on to shapes so as to lie thereon in a relaxed condition. Then follows a steaming at 25 lbs./sq. in. pressure for 2 mins. The half-hose are then withdrawn from the shapes, scoured, and dyed (this latter operation may occupy 2 to 3 hours under boiling conditions if fast-to-washing dyes are employed). It is then advised to treat the dyed half-hose with a softening agent, rinse, hydro-extract and then draw them on to shapes and hot press to secure an attractive shape and finish. In this hot pressing which is carried out in a steam-press it is desirable to operate at a lower temperature than the 230°F. employed in the earlier steaming at 25 lbs./sq. in. pressure. By this method of dyeing and finishing the half-hose can be obtained with a high proportion of its original elasticity and stretch-ability.

A heat treatment is useful in the production of nylon threads which are to be used for sewing threads or as tyre cords for in such uses it is undesirable that the nylon filaments should materially extend in length as a result of stretching while exposed to an elevated temperature or that they should shrink from a relaxed state—it is generally desirable that the filaments should have a very high dimensional stability. A convenient method for giving nylon threads this stability is to subject them to a heat treatment and in practice it has been found that a very convenient method of transferring heat to the threads is to run them through a bath of molten Wood's metal which is an alloy comprising 5 parts of bismuth, 2½ parts of lead, 1¼ parts of tin, and 1¼ parts of cadmium.

It is possible by the use of this Wood's metal more easily to control the temperature within the close limits necessary. But also from the same viewpoint it is better for the metal molten bath to be horizontal although this unfortunately exposes a comparatively large area of metal surface to the air thus inviting undesirable oxidation difficulties. However these troubles can be overcome (B.P. 796,363) by the simple expedient of maintaining on the surface of the molten metal a thin liquid film of an inert high boiling organic compound

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of silicon which is commercially available as Silicone Oil MS.550 (Midland Silicones Ltd.). The only oxidation that can then occur is that due to the small amount of air entrapped within the nylon thread itself. Under these conditions satisfactory heat treatment sufficient to give the desired improved properties in nylon thread can be effected by say running thread through the molten metal at 160 to 240°C. for an effective submerged length of 21 ins. at the rate of 250 ft. per min.

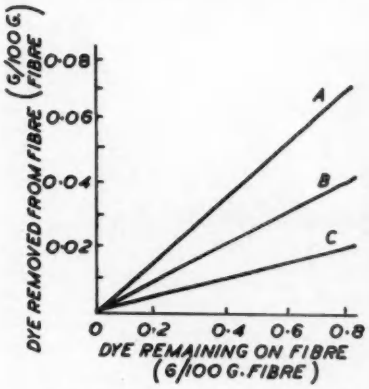

Fig. 3. Curves showing washing fastness of (A) secondary cellulose acetate (B) triacetate and (C) heat-treated triacetate fibres dyed with S.R.A. Fast Red VII

Fluid Beds

The heat treatment of the artificial fibres, cellulose triacetate, and nylon, discussed above has been assumed to be carried out with the aid of a hot air stenter or hot rotating cylinders or even by stationary hot metal plates. But it should be recalled that in recent years so-called "fluid or fluidised beds" have become available and which are claimed as affording a very economical way of heating dry or even wet textile fabrics. These beds, developed especially by the British Rayon Research Association, are useful for carrying out the heat treatments now being discussed.

A fluid bed consists essentially of a container in which a mass of hot fine solid discrete particles such as sand or glass spheres are maintained hot and in free movement by a gaseous (air) current. Fabric or yarn can be easily drawn through the particles without absorbing these to any appreciable degree and at the same time be heated to acquire their temperature. In various ways this method of heating textile material has several advantages and it has already been adapted to allow the production of crease-resist finishes and the fixation of padded dyes. In some ways it is an alternative to the Standfast molten metal bath which has proved very satisfactory in dyeing operations as for example the continuous dyeing of vat shades on cotton fabric. It has been suggested that a fluid-bed can be useful for the heat treatment of polyethylene terephthalate ("Terylene" and "Dacron") fabrics so as to give such materials an increased dimensional stability at high temperatures. The following treament is recommended.

"Terylene" fabric should be led through a fluid bed preferably under conditions such that it cannot shrink to any appreciable degree—a passage occupying but 10 secs. with the fluid bed maintained at 225°C. is suitable. When the resulting heat-treated fabric is at any time thereafter exposed to high temperatures of say 195°C. it would be expected to shrink only 0·25% in the warp and 2·1% in the weft whereas if similarly exposed but before the heat treatment a shrinkage of 9·4% in the warp and 10·1% in the weft could be anticipated. Of course such shrinkage data will to some degree be governed by the texture and weaving construction of the fabric but apart from this the heat treatment is able to give useful stability to the "Terylene" material so that it is less susceptible to shrinkage in high temperature processing.

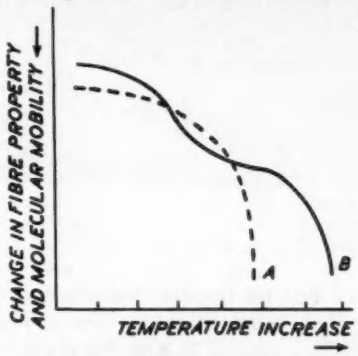

Fig. 4. One stage (A) and two stage (B) curves connecting change of molecular mobility (or fibre property) with increase of temperature in a heat treatment of (A) wholly amorphous and (B) partly amorphous and partly crystalline fibres

There can be no doubt but in the future even greater advantage will be taken of the possibilities of improving the textile properties of all fibres (it would appear especially those artificial ones having thermoplastic properties) by the use of heat (high temperature) treatments. In this article the improvements discussed above were those concerned with the fibre resistance to change on exposure to high temperatures but many other properties are at the same time indirectly affected. And all such improvements follow from the increased mobility or vibration of the molecules as produced by the heat treatment. It is thus important to note that this change of molecular movement is more easily brought about in the amorphous rather than the crystalline regions of the fibre. If the fibre is entirely amorphous (as with a secondary acetate fibre) then as the temperature of the heat treatment is raised so will the molecular mobility progressively increase (and thus produce permanent changes in the fibre properties if the heat treatment is not carried too far and if thereafter the fibre is immediately cooled). On the other hand, if the fibre is partly amorphous and partly crystalline (as for example, "Terylene") then the change of molecular mobility will change in two stages as the temperature of heat treatment is steadily raised—in the first stage it will be amorphous regions mainly affected and in the second stage the crystalline regions. The difference in such behaviour is illustrated by the two curves shown in Fig. 4.

"Terylene" Plant in Ireland

Negotiations for the purchase of options on some 200 acres between Carrickfergus and Kilroot, Co. Antrim, as a site for a future "Terylene" spinning plant have been concluded by I.C.I. Ltd. "Terylene" is at present being manufactured at Wilton and extensions there are due to come into operation in 1962-3. I.C.I. intend that subsequent extensions for "Terylene" spinning should be located in N. Ireland when development of the market for "Terylene" makes these necessary. It is hoped to begin work on the site in 1961 with a view to starting production in 1964. About 1,150 people will be employed when the plant is in full production.

"Terylene" Blends

In the interests of public and traders, I.C.I. Fibres Division are examining all fabrics made from blends of "Terylene" with cotton, rayon or flax before allowing their trade mark to be used on them. The best known blends so far have been the 55% "Terylene"/45% wool blend in both woollen and worsted cloths and the 33% "Terylene"/67% wool blend for men's woollen and worsted suitings over 14 ozs. With the cellulosic fibres more "Terylene" is required and the minimum has been set at 67%. Interest has been shown in the production of "Terylene" and flax and I.C.I. have found that here too a minimum of 67% of "Terylene" is required if the fabrics are to be satisfactory. In all cases the fibres should be intimately blended in both warp and weft and I.C.I. do not support the use of resin treatments.

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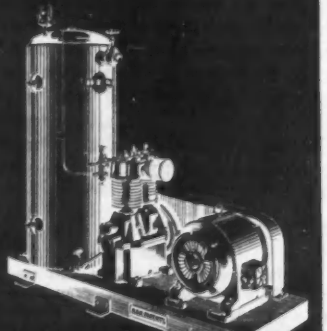

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C.P.322

Crease-Recovery, Water-Imbibition and Co-Valent Cross Linkages

In considering any question of cross-linkage, attention should be given to both low-swelling and high-swelling products

By J. T. MARSH, M.SC., F.R.I.C., F.T.I., F.S.D.C.

THE crease-resisting process, which was invented about thirty years ago by Foulds, Marsh, and Wood[1] in the laboratories of Tootal Broadhurst Lee Co., depends for its success on the application of resinous condensation products within the fibre[2]; it is generally agreed that the resin is situated in the amorphous regions of the cellulose. Within the past ten years, however, more and more interest has been displayed in the precise mechanism which produces crease-resistance and other associated effects. It appears to the writer that there is some danger of over-simplification in the natural wish to state a case as simply and convincingly as possible.

This note attempts to draw attention to three features which seem to need fuller consideration than has been given recently; there is no intention of laying down the law, nor of attacking the speculative propositions of other workers in the field, but rather to help in the further meditation and profound thought which this highly important finishing process warrants. Different theories are only the result of regarding the same facts from another point of view, according to which certain features may be in the foreground or background. The full consideration of crease-resisting theory may be the subject of a further publication later.

Crease-Recovery

In discussing the possibilities of co-valent cross-linkages, Cameron and Morton[3] stated in 1948 that the suggestion is based on inadequate experimental evidence and the theory has fallen into considerable disrepute. For example, they refer to a remark by Wood[4] to the effect "that until there is definite evidence of chemical combination I should prefer to regard the deposition of resin inside the fibres as sufficient explanation of the physical effects produced."

Cameron and Morton clearly state that they believe the true picture to lie intermediate between the two extreme views (i.e. of co-valent cross-linkages on the one hand, and of internal resin deposition on the other hand).

Such a picture had been presented previously by the writer from 1937 onwards, being published in 1946[5], on the basis of molecular entanglement; this embraced a variety of crease-resisting products produced in different ways, but it was not mentioned by Cameron and Morton, and in spite of their support of the intermediate view, they have been regarded for over ten years as the foremost advocates of the hypothesis of crease-resistance by co-valent cross-linkages. In 1955 Morton stated[6] that the evidence for cross-linking is purely inferential but is not less well grounded for that.

Nevertheless, some twenty years after the formulation of the entanglement hypothesis, the writer is still of the opinion that it covers the field; it includes co-valent linkages as with methylene cellulose and entangled side-chains as with cellulose acetate. Strict adherence to the theory of co-valent cross-linkages is considered to be an over-simplification, unsupported by adequate chemical evidence, and sometimes difficult to reconcile with the facts.

Water Imbibition

Cameron and Morton have stated that the presence of stable cross-linkages is indicated by a marked reduction in the imbibition value.

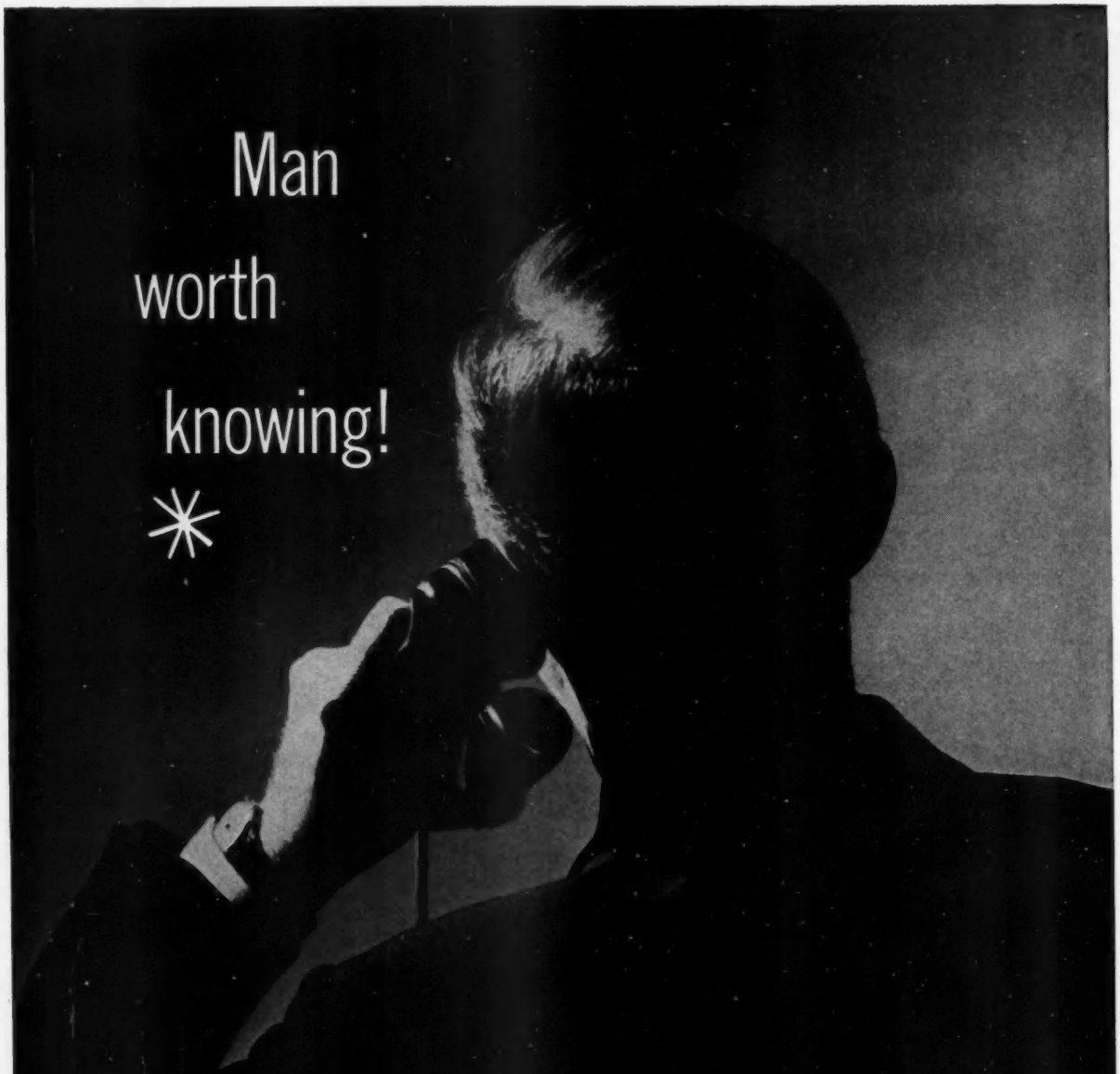
Water-imbibition is expressed as water-retention after centrifuging, and some of the earliest work was done by Coward and Spencer in 1923[7] in connection with the mercerising process; they confirmed that water-retention was reduced on drying and observed that it could also be reduced by boiling in water. The effect of the temperature of washing and also of drying was examined in greater detail with a more powerful centrifuge by the writer, whose results were published in 1941[8].

The reduction in water-retention of rayon on drying has been discussed by Hubert, Matthes and Weisbrod[9], whilst Rumens[10] has referred to the work of a number of authors on the effect of repeated drying on the "swelling value" of cotton, rayon, and wool.

Attention should be drawn to the dangers of assuming that reduced water-imbibition is an index of cross-linking; it is one of many techniques for measuring the accessibility of cellulose, and reduced water-imbibition only means reduced accessibility of hydroxyl groups in cellulose. Reduced absorptive capacity follows drying and heating because of the formation of hydroxyl-hydroxyl hydrogen bonds, but the hydroxyl groups may be blocked in other ways; for example, by simple substitution as with cellulose acetate. Hence a mono-functional reagent can reduce the accessibility of cellulose just as well as a bifunctional reagent like methylene glycol (i.e. formaldehyde).

When Meunier and Guyot re-examined Eschalier's process in 1929[11] they used the well-established centrifuge technique as a first approximation to relative swelling values and made quantitative observations on what we now call the accessibility of cellulose. They were the first to postulate the methylene bridge between adjacent molecular chains from evidence of water-imbibition.

Meunier and Guyot, however, provided no data to show the relation between the amount of combined



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formaldehyde and the reduction in water-imbibition of the treated rayon; indeed, no chemical tests were done to show the presence of formaldehyde in their products.

Even after thirty years, there appears to be no successful isolation of cross-linked glucose or cross-linked cellobiose from the products of hydrolysis of cross-linked cellulose. Water imbibition may be affected by other than chemical means; for example, the cuticle of cotton restricts its swelling which is also reduced by high-twist yarns and tightly-packed fabrics. The external coatings of resins and other film-forming compounds will reduce the water imbibition by purely physical restraint, as also will internal deposition of resins; the latter, however, occupy part of the amorphous regions of the fibre, and one would not expect to get a pint of water into a pint pot which already contained quite a substantial amount of solid matter.

The imbibition of water by cellulose fibres can be affected by internal or external physical constraint, by zones occupied by foreign bodies, by hydrogen bonds between hydroxyl groups in adjacent molecular chains, by hydrogen bonds between polar groups of resins and hydroxyl groups of cellulose, by chemical blocking of hydroxyl groups through the introduction of side-chains, as well as by the formation of co-valent cross-linkages. Acid hydrolysis alone will also reduce water-imbibition.

Methylene Cellulose

The work of Eschalier in 1906 involved treating cellulose with formaldehyde under conditions of dehydration and was directed to improving the strength of regenerated cellulose, particularly the wet strength; for some time the process was called "sthenosage" (from the Greek *sthenos* or strength). In 1908, it was found by Cross and Bevan[12] that the amount of combined formaldehyde varied between 0·35 and 0·8%.

Little more appeared in the literature until 1926 when Bruckhaus[13] repeated Eschalier's work and found that the final product dyed more deeply, in contrast to the observations of Eschalier and of Cross and Bevan.

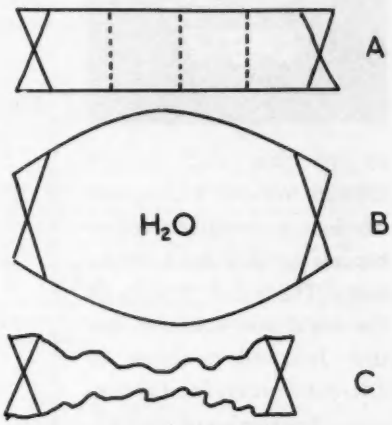
However, in the meantime formaldehyde had been used to restrain the action of sulphuric acid which is a strong dispersing agent for cellulose; the work of Barrett and Foulds in 1922[14] is now known to produce a methylene cellulose under conditions of hydration as opposed to dehydration. The deeper dyeing effect was commented upon by Mennell in 1926[15], but it was not until the work of Wood in 1931[16] that it became clear that there were two distinct stages in the reaction with formaldehyde according to the methods of Eschalier and whilst both gave insolubility in cuprammonia, the absorbency for dyestuffs and for copper was decided by the water content at the time of reaction. Hence the effects of Bruckhaus were explained in that he did not obtain the low moisture content of the original Eschalier process.

Wood also examined the work of his colleagues, Barrett and Foulds, and found that the use of 66 to 90% H_2SO_4 containing 4% or more of paraform gave a methylene cellulose containing 2 to 7% of combined formaldehyde and which possessed a high degree of swelling comparable with that of methyl cellulose; not altogether satisfied with the idea of cross-linkages, he suggested the possibility of a methylene bridge between the hydroxyl groups in the 2 : 3 positions of the same glucose residue, a possibility which should be kept in mind today.

The two extremes of methylene cellulose were clearly established, namely low-swelling and high-swelling, but the latter is frequently overlooked. In 1939, however, a high-swelling methylene cellulose was described by Morton[17] who treated cotton so as to obtain 3 to 4% of combined formaldehyde; the concentration of H_2SO_4 were much lower than those used by Barrett and Foulds and in general varied between normal and decinormal strength. An important feature was the maintenance of the cellulose in the swollen state during the reaction.

It is not easy to reconcile the existence of high-swelling methylene celluloses with the view that the presence of cross-linkages is indicated by reduced water-imbibition. There are compounds other than methylene cellulose which exhibit high water-imbibition in spite of the co-valent cross-linkages. For example, a process of 1949[18] depends on the impregnation of cellulose with a bifunctional reagent such as epichlorhydrin or dichlorpropanol followed by alkali; the treatment takes place with the cellulose in the swollen state and there is no heating in excess of 80°C. or dehydration during the reaction. The product is insoluble in cuprammonia and exhibits high swelling; indeed, it is stated that low swelling indicates bad treatment. It is believed that a somewhat similar process has been used in the U.S.A. during 1958.

In considering any question of cross-linkage, therefore, attention should be given to both low-swelling and high-swelling products. The low-swelling products are generally formed under dehydrating conditions, often at temperatures over 100°C., and depend on syneresis for their effect; it should not be forgotten that the reduced water-imbibition is not entirely due to co-valent cross-linkages and that some of it is due to hydrogen bonding, which is a concept dating only from 1930 to 1935 (?).



Diagrammatic representations of—
(A) Dry crease-recovery of collapsed fibre
(B) Wet crease-recovery of swollen fibre
(C) Absence of crease recovery of (B) when dry

The high-swelling products are formed under conditions in which the fibre is swollen or even dispersed and depend on diaeresis for their effect; where the cross-link is introduced in the swollen state, the chain molecules will be kept apart and there will be less tendency to hydrogen bonding and a great accessibility of the hydroxyl groups in the cellulose.

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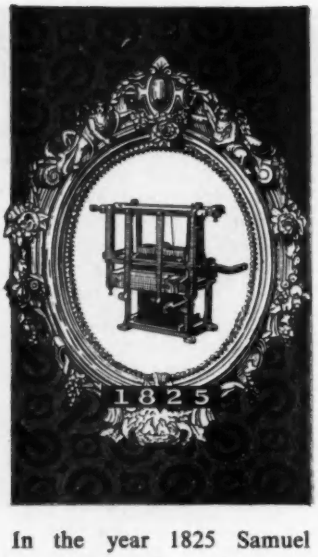

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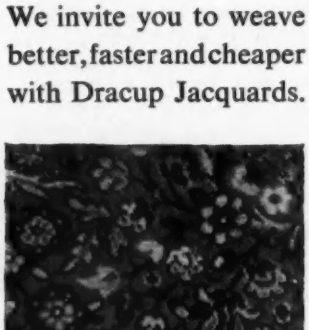

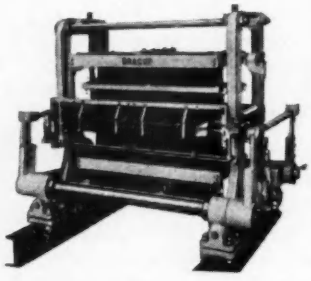

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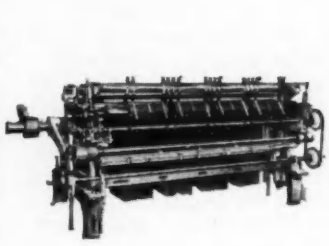

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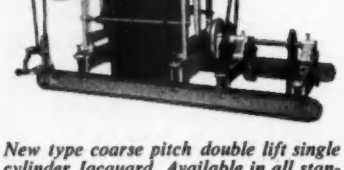

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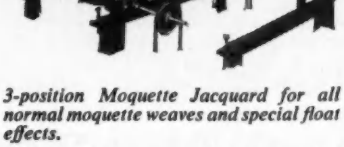

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Book Reviews

VERTEILUNG DER BASTFASERN IM VERZUGSFELD EINER NADELSTABSTRECKE. By W. Rohs and L. Steinmetz. Report No. 609. Westdeutscher Verlag Koeln and Opladen. 1958. Pp. 42 (price DM 13·45).

Entitled the "Distribution of Bast Fibres in the Drafting Zone of a Gill Box Drafting System" this research report describes and assesses the results of a series of experiments undertaken with long fibres and tow flax. The work was carried out on the third draw frame passage of a normal spinning sequence by cutting across the width of material in the drafting zone at 2 cm. intervals, weighing the fibre in each strip, and expressing the results diagrammatically. Many variations in the available parameters, particularly the degree of drafting and doubling, were undertaken for comparative purposes. A special version of the Haase-Deyerling Textronograph capacitance evenness tester was employed to obtain speedier readings of fibre mass variation, the limitations of this method being detailed. The report concludes with a theoretical analysis of the fibre distribution.

B.S.

* * *

DIE MASSEUNGLEICHMAESSIGKEIT VON FLACHSSTRECKENBAENDERN IN ABHAENGIGKEIT VON VERZUG UND DOPPLUNG. By W. Rohs and L. Steinmetz. Report No. 435. Westdeutscher Verlag Koeln and Opladen. 1957. Pp. 29 (price DM 9·90).

The object of the work described in this report was to apply to flax drafting and doubling the statistical theories of Martindale, Foster, Cox and Ingham which have been previously applied to conditions in cotton and wool spinning. A brief review is given of the basis equations relating to sliver irregularity, with particular reference to the effects of drafting and doubling, and to the effect of the specimen length of the test samples.

Using a Textronograph electronic capacitance evenness tester in conjunction with an Integraph analyser, and also using the "cut and weigh" technique, the co-efficient of variation along the length of the sliver was obtained, based on different sample lengths. These were applied to slivers taken from the second stage of a four-stage flax drafting system, using drafts from 6 to 16, with doublings from 2 to 8. The results of the experiments are summarised on a monogram showing the effect of the degree of doubling or drafting on the co-efficient of variation of the material tested. A detailed analysis of the results is given in the light of theoretical expectations.

B.S.

* * *

UNTERSUCHUNGEN ZUR VERBESSERUNG DES LEINENWEBSTUHLES V. By W. Rohs and H. Griese. Report No. 621. Westdeutscher Verlag Koeln and Opladen. 1958. Pp. 42 (DM 11·30).

Following an earlier report published in 1955, this account continues the study of loom warp beam let-off motions undertaken by the Bielefeld Bast Fibre Research Centre with the object of improving the performance of linen looms, particularly Linen Loom V. Three early friction let-off motions are compared with a new type of friction let-off employing a beam presser to maintain a retarding torque proportional to the beam diameter. The tension on a single warp thread was tested for each motion, using an electronic inductance unit described previously. Results are given for mean and range tensions. Detailed comparisons and recommendations are made, which favour the self-adjusting motion in so far as labour utilisation is concerned.

B.S.

* * *

LANCASHIRE TEXTILE INDUSTRY, 1959. John Worrall Ltd., Central Works, Oldham (price 30s.).

Fully maintaining its high reputation for the wealth of information and accuracy of detail, this new edition has had the customary careful revision demanded in such a work. The general directory includes an index to towns and villages, a directory of cotton spinners, manufacturers and allied trades of Lancashire, a classified list of trades, yarn producers and processors, a list of fabrics and the firms engaged in their manufacture, also lists of managers, secretaries and salesmen. The buying section includes a buyers' guide, also sections concerned with machinery, chemicals, raw materials and piece goods. The volume also has very valuable sections of a commercial and statistical nature.

A.D.

* * *

FIXED FIRE EXTINGUISHING EQUIPMENT IN BUILDINGS. Fire Protection Association, 31-45 Gresham Street, London, E.C.2 (price 1s. 6d.).

This new booklet reviews the various extinguishing systems available and summarises their individual requirements. The greater part of the booklet is taken up by the section dealing with systems using water as an extinguishing agent—hose reels, private hydrant systems, automatic sprinkler systems, drencher systems and special water spray systems. Other sections cover foam systems (suitable for flammable liquid risks), carbon dioxide installations (for dealing with fires in flammable liquids and electrical equipment) other gas and vapour systems and dry powder systems.

* * *

ZUGPRUEFUNGEN AN TEXTILIEN MIT EINER WEGLOSEN, ELEKTRONISCHEN KRAFTMESSEINRICHTUNG. By H. Stein. Report No. 700. Westdeutscher Verlag Koeln and Opladen. 1958. Pp. 103 (DM 32).

The new "Statigraph" strength tester, developed at the Institute for Textile Measuring Techniques in M. Gladbach, is described in considerable detail in this monograph, together with numerous illustrations of its applications. The instrument consists of three distinct parts: an upper jaw attached to a very stiff cantilever which acts as the moving part in a differential transformer; a lower jaw which is moved to give a constant rate of extension, with a wide range of adjustment; and an electrical pen recorder of standard design. The whole is a well designed, compact instrument, suitable for most load-extension applications where a constant rate of loading is required.

The many typical load-extension diagrams given deal with applications to sliver, spun and filament yarns of all types, yarn bundles, and fabric, the latter including tear and seaming strength. As well as simple tests to breaking strength, the effect of pre-loading and of repeated loadings and unloadings is presented to show hysteresis effects. Some results of relaxation experiments are also given. Instead of giving a catalogue of all the research reports published to date, there is at the end of this monograph a list of the reports dealing specifically with textile technology, fibre research, and laundry research—a list of particular value to librarians.

B.S.

* * *

DETERMINING FLUIDITY OF LINEN MATERIALS IN CUPRAMMONIUM HYDROXIDE SOLUTION. British Standards House, 2 Park Street, London, W.1 (price 4s.).

This British Standard (B.S. 3090 : 1959) specifies a method for determining fluidity of linen materials in cuprammonium hydroxide solution. It is based on Textile Institute Tentative Textile Standard No. 45, adapted from the method developed by L.I.R.A. The method provides an indication of the degree to which the flax fibres may have been degraded during processing.

* * *

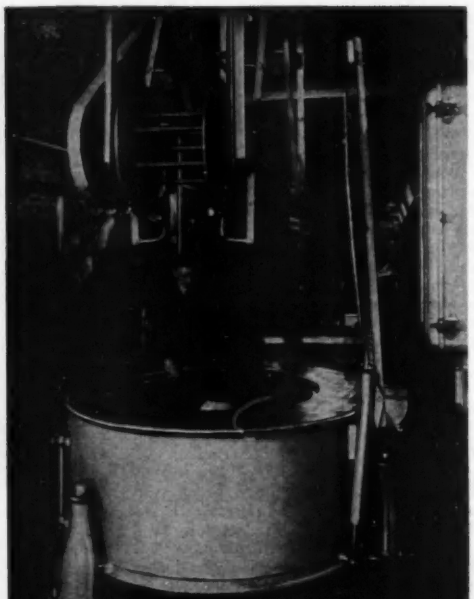
TEST FOR RECOVERY OF FABRICS FROM CREASING. British Standards Institution, 2 Park Street, London, W.1.

This new British Standard (B.S. 3086 : 1959)—applicable mainly to apparel fabrics—specifies a method of determining exactly what crease-resistance means. The test involves folding in half a rectangular specimen and applying a specified load to it for a fixed time. The load is then removed and the angle between the "arms" of the specimen measured on a special piece of apparatus. The publication provides instructions for preparation of apparatus and test specimen, and for the test procedure.

* * *

TEST FOR COTTON FIBRE MATURITY (ESTIMATION BY CLASSIFICATION OF FIBRES SWOLLEN IN SODIUM HYDROXIDE SOLUTION. British Standards Institution, 2 Park Street, London, W.1 (price 3s.).

A test for maturity of cotton developed many years ago at the Shirley Institute, and recently issued as a tentative textile standard, is now published as B.S. 3085. For cottons of similar length and perimeter, mature cottons with thick walls generally give fewer neps, are usually more lustrous, and often dye deeper in shade than immature cottons with thin walls. Because cotton fibres vary in wall thickness and perimeter, the fibre maturity is generally best characterised in terms of a ratio—the "degree of wall thickening"—independent of perimeter, and equal to the ratio of the actual cross-sectional area of the wall to the area of the circle with the same perimeter. Direct measurement of the degree of wall thickening is too laborious for most practical purposes and this test, originally known as the immaturity count, was evolved as an indirect method suitable for routine use.



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Export Opportunities

Italy:
Textile Goods

"European," Viale Miliani 37, Fabriano (Ancona), Italy, would like to represent U.K. manufacturers of linen and cotton cloth for sheets, table linen, handkerchiefs, bed covers, also mohair and camel-hair cloth. Established in 1955, they are wholesalers of textiles and represent a U.K. manufacturer of blankets. Manufacturers interested should write direct, also notify the British Consulate, Commercial Section, Palazzo Antinori 3, Florence.

Bahrain:
Textile Goods

The British Political Residency in Bahrain would like to receive trade literature from small manufacturers interested in Middle East Trade, so that they may circulate it to local importers. Catalogues describing the following are required:—

(1) Children's wear (under and outer).
(2) Hosiery.
(3) Curtaining material.
(4) Knitting wools.
(5) Men's underwear.
(6) Shirts.

Interested manufacturers should send literature direct to the British Political Residency, Commercial Secretariat, Jufair, Bahrain.

Switzerland:
Table Linen

Luchsinger and Co., Bollwerk 31, Berne, would appreciate offers from U.K. manufacturers of high class damask table linen with hunting scenes woven into the fabric. Founded in 1921, they are wholesalers and retailers of woollen piece goods, linings, linen and household textiles. Manufacturers interested should write direct, also notify the Commercial Department, British Embassy, Willadingweg 83, Berne.

U.S.A.:
Piece Goods

The Strong-Wear Co. Inc., 113 - 23 West Conway Street, Baltimore 1, Maryland, want to contact U.K. manufacturers of tweeds, herringbones, synthetic fabrics and rayon and cotton linings. Established in 1933 they manufacture suits, sportscoats and topcoats and sell to clothing stores, department stores and jobbers throughout the U.S.A. Manufacturers interested should write direct giving f.o.b. and c.i.f. Baltimore prices in U.S. currency, also copying their correspondence to the British Consulate, Commercial Section, Suites 611 and 612 Keyser Building, Calvert and Redwood Street, Baltimore 2, Maryland.

Singapore:
Piece-Goods

Hong Leong and Co. Ltd., 144 Robinson Road, Singapore 1, are anxious to get into touch with U.K. exporters of rayon, cotton and woollen piece-goods, and chemicals. They are an old-established firm and exporters interested should write direct also notify the U.K. Trade Commissioner, Fullerton Building (Third Floor), P.O. Box 620, Singapore.

Dubai:
Textiles and Oils

Mir Muhammad Saleh Amiri Awazi, c/o Dubai P.O., Dubai, Trucial States, would like to get into touch with U.K. manufacturers of textiles (especially man-made fibres) and lubricating oils. The firm are commission agents dealing in a wide range of goods and manufacturers interested should write direct, also notify the British Political Agency, Dubai.

British East Africa:
Furnishing Fabrics, etc.

Ross and Co. (E.A.) Ltd., P.O. Box 150, Nairobi, are interested in U.K. agencies for sports jackets and contemporary furnishing fabrics. Incorporated in Kenya in 1953, they hold a number of U.K. agencies for a variety of products. Suppliers interested should write direct also notify the U.K. Trade Commissioner, P.O. Box 30133, Memorial Hall, Nairobi, Kenya.

Western Germany:
Suitings

Dr. G. Hohl, Euskirchen, Beethovenstrasse 33, is interested in representing U.K. manufacturers of men's and women's good quality suitings. He has been in the textile trade as a commission agent for several years and can cover a wide area of the Federal Republic but normally operates in Northrhine - Westphalia. Manufacturers should write direct, also notify the British Consulate-General, Cecilienallee 16, Duesseldorf.

Hong Kong:
Jersey Fabrics, Hosiery, etc.

Lee and Leong Bros. Ltd., manufacturers' agents, 1001-2 Yu To Sang Building, 37 Queen's Road Central, Hong Kong, want to contact U.K. manufacturers when a director, Mr. R. T. Leong, visits England on a business trip this summer. He seeks a range of high quality men's, women's and children's knitted outerwear, men's high quality wool hosiery, men's and women's wool underwear, and jersey fabrics. His firm sells to woollen and worsted piecegoods wholesalers and tailors, department stores and to the garment trade. Manufacturers interested should write sending brief details of their products to reach him c/o Room 732, Export Services Branch, Board of Trade, Lacon House, Theobalds Road, London, W.C.1.

Bahrain:
Dress Netting

Mr. K. H. Khiara, P.O. Box 384, Manama, Bahrain, wants to contact U.K. manufacturers of dress netting not already represented in Bahrain. Quotations are required for material 35 - 36 ins., in black and other colours, with about 27 - 28 holes per sq. in. Mr. Khiara says he hopes to sell up to one million yards a year. Manufacturers interested should write direct, also notify the Commercial Secretariat, British Political Residency, Jufair, Bahrain.

Western Germany:
Piece Goods, etc.

Mr. F. Gosse, of Koln, Hahnenstrasse 14, wants to contact manufacturers of men's wear (particularly raincoats), and piece goods. He is the sole proprietor of the firm of Ferdinand Gosse, established in 1953 as a wholesale and agency business dealing in textiles and tailoring requirements and covers the whole of the Federal Republic on a commission basis. Firms interested should write direct also copy correspondence to British Embassy, Commercial Department, 77 Friedrich-Ebert Allee, Bonn.

Ceylon:
Ribbons, etc.

Mr. E. H. Nicholas, 16 Gaffoor Building, Main Street, Colombo 1, would like to get in touch with a U.K. supplier of ribbons and similar lines. He established his business in 1946 and covers the whole of Ceylon with the assistance of five travellers. Suppliers interested should write direct, also notify the U.K. Trade Commissioner, 2nd Floor, Hong Kong Bank Building, P.O. Box 745, Colombo.

Australia:
Lace

Mylona Fabrics Pty. Ltd., 181 Clarence Street, Sydney, wish to contact U.K. suppliers of leavers lace and raschel lace for underwear and allied products. Established in 1948, they have their own import quotas and handle goods on both an indent basis and as wholesale distributors, and cover the whole of Australia with salesmen. Suppliers interested should write direct, also notify the U.K. Trade Commissioner, Prudential Building, 39-49 Martin Place, Sydney.

British East Africa:
Piece-Goods

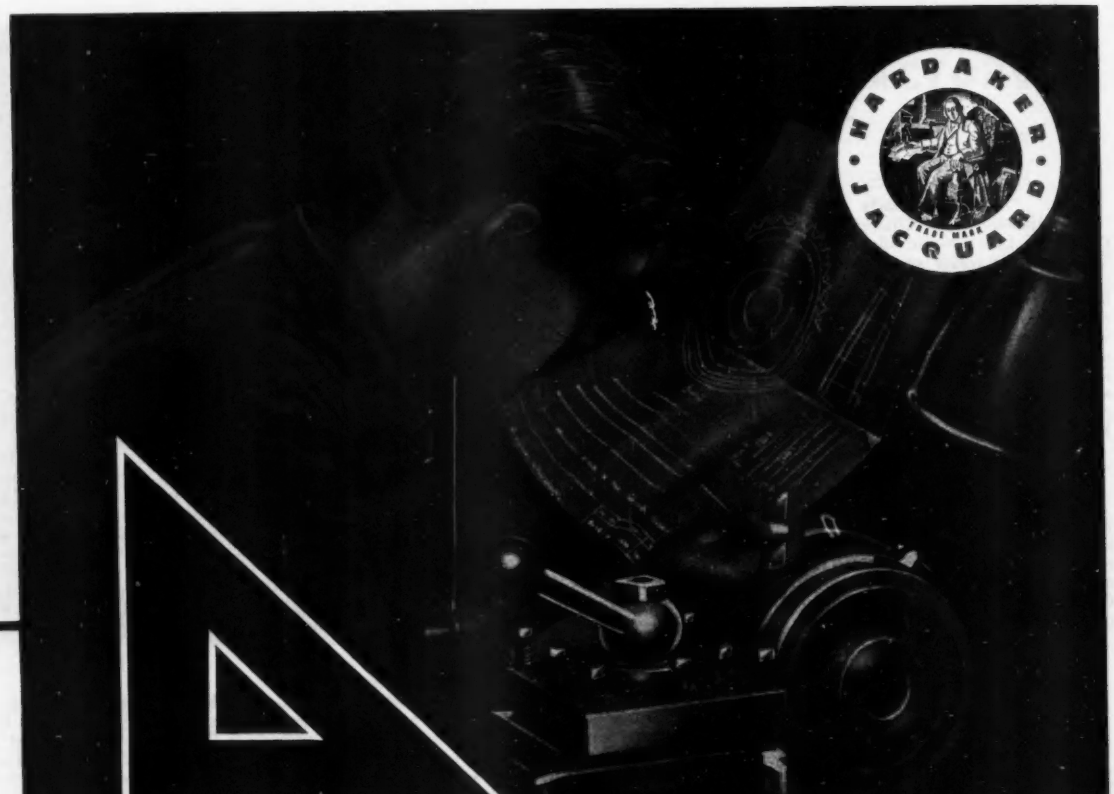
United Marketing Co., P.O. Box 579, Nairobi, is visiting the U.K. from June 6 to July 20 and can be contacted through H. C. Simons and Co., Shell House, 55 Bishopsgate, E.C.2. They are looking for new agencies particularly piece-goods. They hold a useful nucleus of agencies and have branch offices in Mombas and Dar es Salaam. Interested firms are invited to write to the above address enclosing literature and quotations.

Sudan:
Piece-Goods

Sayed Ahmed Mohamed Yassin, P.O. Box 895, Khartoum, wants to contact U.K. manufacturers of poplin piece-goods. Manufacturers interested should write direct also notify the British Embassy, Commercial Secretariat, P.O. Box 801, Plot 1, Abbas Avenue, Khartoum.

South Africa:
Furnishing Fabrics

Tod and Young, Balmoral House, 100 President Street, Johannesburg, are particularly interested in obtaining U.K. agencies for furnishing fabrics. Established in 1948, they are manufacturers' representatives and at present represent four offices in Johannesburg and Cape Town and cover the whole of the Union of South Africa. Suppliers interested should write direct, also notify the U.K. Trade Commissioner, P.O. Box 10101, Johannesburg.



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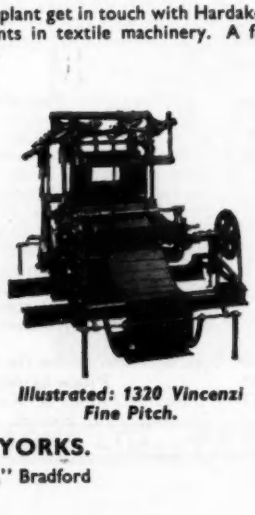

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Textile Trade and Prospects

Cotton's Uncertain Future

During the past few weeks a little more confidence has been felt in yarn and cloth trading circles, although the Government's White Paper on reorganisation contains little to enthuse about. Hardly anyone can be expected to rave enthusiastically at the prospect of scrapping millions of spindles with correspondingly large amounts of doubling, weaving and finishing, etc., equipment. Arguments about excess producing capacity often ignore the fact that work could be found for a considerable proportion of stopped machinery if the price factor of finished goods did not make things impossible. There is no justification at all for the prices still being demanded in many wholesale and retail activities and it is another example of the tail wagging the dog. As an example, the writer of these notes recently saw in the window of a well-known Manchester shop a furnishing fabric boldly marked as "a must" at 10s. 6d. per yard. Frankly, it looked good even at this price, but the writer had some weeks before bought the identical cloth straight from the manufacturer—finished—at 4s. 3d. per yard. What is mistakenly described as "good business" is often nothing more or less than sharp practice.

The possibility of large numbers of spindles being quickly condemned has had the effect of stimulating yarn inquiry over a very wide range of counts and qualities. Prices have hardened slightly arising from this better tone but there are still instances of weak selling to keep running. American type yarns in medium numbers and standard weaving qualities have been the ones in most request on ring beams, cones, cheeses and hanks. Hosiery qualities have been in better demand in both single and folded form. Fine combed counts have been better supported than for many months but much more firm business could be accommodated for immediate delivery. Short-time working in many mills still managing to run cannot help but keep the margins at unsatisfactory levels. Coarse counts have been in better request and condenser yarns are now being absorbed fairly well in view of the present extremely unsettled conditions. Speciality yarns, e.g., gimps, cords, loops, slub and flake, etc., find reasonably steady outlets and blended natural and man-made staple yarns are in good demand.

A sharp increase in the sales of clothing in recent weeks has had its repercussions in the manufacturing end of the trade. Inquiry has covered a large range of apparel cloths and business booked has been distinctly better than for a long time. Dress goods in cotton, rayon, etc., and mixtures have been the subject of many transactions. The volume of firm inquiry has given salesmen a greater degree of confidence in negotiations. Fabrics sold have covered an extremely varied range from neat dobby and jacquard woven styles to plain piece-dyed cloths and new designs on roller and screen printed cloths. A similar uplift in the interest in furnishing fabrics has been reflected in slightly better sales in contemporary and traditional designs in fabrics coming within the medium price brackets. Cheap cloths are now as hard to sell as the more expensive ones.

Household textiles maintain a reasonable tempo. Table cloths, sheets, etc., and cotton blankets are selling rather better and quilts are again been asked for; woven and tufted types are both in better demand. Business in terry cloths tends rather to ebb and flow but some good lines have been ordered in jacquard woven qualities in strong, colourful contrasts. Roller towelling is in very poor request with little likelihood of any improvement in the near future. Printed terry for making-up purposes finds ready buyers at firm prices. Industrial cloths have been moving rather better in both medium and heavy types. Export business is still pathetic but one or two modest lines have gone through for certain Continental, Near Eastern and Commonwealth markets. The total is extremely small in the amount of potential business if only a solution could be found to the problems of prices, duties and restrictions.

World Wool Output and U.K. Consumption

Total production of raw wool in the free world in the current 1958-59 season is estimated at some 4,155 mill. lbs., greasy basis, or less than 1% more than the previous season's total of 4,127 mill. lbs., according to revised figures issued by the Commonwealth Economic Committee. Commonwealth production is expected to show a rise of nearly 2%. An increase is forecast in Argentina but a sharp reduction is expected in Uruguay.

Since the first preliminary estimate of world output last September, a revised estimate of the Australian clip puts that country's total at 1,459 mill. lbs., or 2% more than the amended 1957-58 figure of 1,433 mill. lbs. The New Zealand Wool Board's March estimate of production was unchanged from the earlier figure of 505 mill. lbs., but the South African Wool Board's preliminary estimate of the 1958-59 clip, at 306 mill. lbs., is slightly lower than the provisional figure published in December, though it shows a rise of 2% on the revised 1957-58 total of 299 mill. lbs. Latest estimate of the Argentine Wool Federation puts Argentine production at 421 mill. lbs., or 3% more than in the previous season, but the Uruguayan estimate has been amended downward to about 165 mill. lbs., or 17% less than in 1957-58, due to bad weather and consequent heavy mortality among lambs. The official preliminary estimate of United States production in 1958 is 293 mill. lbs., the same as the revised 1957 total.

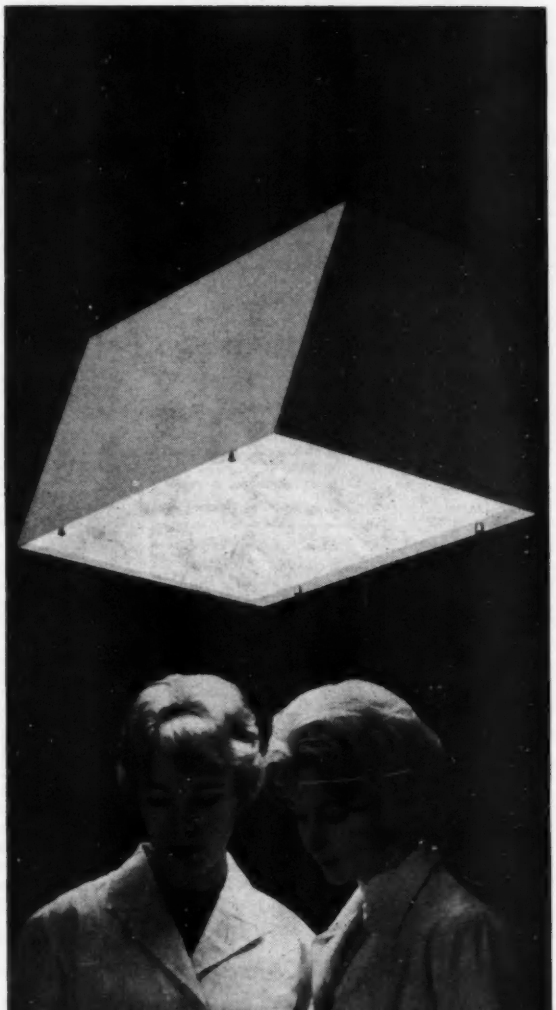
Although a little below those of February, the U.K. rates of wool consumption, top production and worsted yarn delivery during March were appreciably higher than in March last year, according to the Wool Industry Bureau of Statistics. Possibly because Easter occurred during March, the rate of wool consumption that month was 3% lower than in February but it was 10% higher than a year earlier. Consumption for topmaking purposes was 9% higher and for woollen trade purposes 11% higher. Tops were produced at a rate 4% lower than in February but 11% higher than a year ago. Merino content was 15% higher, the crossbred content slightly lower. Worsted yarn delivery rate was 4% lower than in February but more than 3% above March last year. The rate of delivery in woven fabrics, however, was not only 2% lower than in February but 4% below a year earlier. Output figures for March: wool consumption, 41·20 mill. lbs. (clean weight); top production, 27·41 mill. lbs.; tops drawn, 17·65 mill. lbs.; worsted yarns delivered, 17·56 mill. lbs.; woven wool fabrics delivered, 27·77 mill. sq. yds.; blankets delivered, 1·96 mill. sq. yds.

Higher prices for all descriptions were paid at a recent Bradford sale of British wool when the Committee of London Wool Brokers, acting for the British Wool Marketing Board, offered about 2½ mill. lbs. of domestic fleece wools. Compared with the Leicester sale in April, picks and supers were par to 2½% dearer, and fine topmaking and halfbreds advanced 5 - 7½%. Massams were 2½% dearer, Radnor and Welsh types advanced 7½ - 10%, and Swaledale and Scotch (English grown) wools were 10 - 12½% dearer. The total offering was cleared under good competition.

Linen Trade Review

The improvement noted during the last few months has been sustained, and the volume of incoming orders covers current output. Yarn and cloth stocks are at a lower level than for many months and most bookings are for forward delivery. Present satisfactory conditions are related to normal spring buying activities, which were protracted this year and consequently do not represent a general expansion of the consumer market. The recent mark up of yarn prices from uneconomic levels has provided an incentive to weavers and merchants to cover against possible future advances as raw material deliveries ease off towards the end of the season.

Mill and factory executives are actively occupied with economic problems for which a solution must be found to enable the industry to meet increasing competition from linen manufacturing centres abroad, as well as the expanding volume of rival textiles, now firmly entrenched in all consumer markets. Improved processing techniques and research have enabled them to extend serviceability and quality characteristics, but these have not contributed materially to the problem of bridging the price gap which is the main



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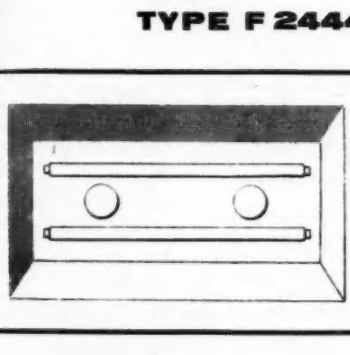

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Complete with control gear, lamps (2 filament and 2 blue fluorescent) remote control box and 2 yd. 7-core cable.

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obstacle to a permanent expansion of demand.

The economic problems of the linen trade differ materially from those of the other natural fibre industries in this country. While the latter are faced with expanding manufacturing capacity in former consumer markets, which usually give preference to the domestic product, there has been no corresponding growth of the linen industry at home or overseas, and competition in all its markets stems only from cotton and the newer man-made fibre textiles. This could be met, and demand expanded, by bridging the price gap which at present favours the latter.

An economic survey of the industry's resources and productive capacity is a necessary first step in this direction. It must include the raw material section which, although in no way linked with manufacturing capacity, has through the volume, quality and price of flax supplies, largely determined the range and selling price of end products.

With raw material representing from 40 to 60% of the yarn cost, and approximately one-third that of the finished fabric, it is obvious that an assured supply at a reasonably stable price is essential to competitive capacity at retail market level. During the last five years raw flax prices have registered a more rapid decline than those of cotton, and have now reached a stage at which the crop is an uneconomic propostion to West European producers, on whom the wet spun section of the trade relies for the bulk of its raw material requirements. It has been proved that the related problems could be solved by modification of the fibre extraction and spinning operations. It has yet to be established whether this solution would be acceptable to both sections. If so, it would contribute materially to a reduction of manufacturing cost.

The extent of redundancy will be measured by the industry's competitive power, which can be increased by further economies in manufacturing cost, suggested by more effective use of modern equipment and the wider application of shift working, essential to ensure an adequate return on the heavy capital outlay on ring spinning frames and automatic looms, with the plant required for modern finishing treatments.

Opinion is divided on the merits of integration as a solution to the problem of economic operation, and the success of recent re-groupings in the trade will be followed with interest. While certain advantages are admitted records of the difficult years between World Wars I and II showed that, generally, the smaller individual unit fared better by reason of its greater flexibility in adjustment to fluctuations in demand.

It is evident now that, for the first time in the history of the country no fibre flax will be produced on a marketable scale in Ireland this year. The consequences will be felt most keenly by the spinning section, which has been directly responsible through its preference for imported material. During the inter-war period, when the disparity in price and quality between home grown and imported fibre was approximately similar to to-day leading firms in the trade used a percentage of home grown flax as a matter of policy to ensure an alternative supply which could be expanded in an emergency, and which at all times exerted a stabilising influence on price levels in world markets.

Present economic factors relative to fibre and processing costs weigh the scales heavily in favour of man-made fibre products against linen where both are directly competitive. In the event, and in view of the merits of the flax spinning system for processing man-made fibres, the downward trend of consumption of the latter by this section of the textile industry —as evidenced by recently published statistics—points the need for more active research on ways and means of expanding the range of end products.

Jute Fibre, Yarn and Cloth

Raw jute has remained firm in Pakistan for higher grade of old crop fibre. Offers of the better qualities of white and dark jute are scarce with a genuine shortage of good class fibre. This lack of quality has resulted in a widening of price margins between the various grades. The fact that India has purchased only about one-third of the quantity of jute from Pakistan compared with the previous season has not helped. It is now common for shippers able to make offers of small parcels of the higher grades to combine them with a lower quality. These offers are often on the basis of one bale of high grade fibre for two of a lower quality. The intention of the Pakistan Jute Board to restrict the number of marks may simplify matters but some names will disappear which have become well known in the industry. It is proposed that shippers only will be the registered holders of marks and not as at present where sellers can have fibre baled under certain names.

Dundee spinners have secured more raw material from the present crop than their actual cut-up for twelve months. From July 1, 1958 to April 30, 1959 registered sales to the U.K. amounted to 839,827 bales compared with 606,746 for the previous season, and 708,152 in 1956-57. Dundee spinners are showing more willingness to purchase new crop fibre for forward shipment. Reports regarding the progress of the new crop are favourable but the Pakistan government is enforcing the ban on sowings in the border areas and in districts which produce only low grade jute. Offers of old crop fibre are irregular with Mill First lowest at £115, Mill Lightnings at £94, Mill Hearts at £79 10s. and grade Hearts at £65, c.i.f., U.K., for May/June shipment. Grade Tossa-2/3 is scarce and values nominal in the vicinity of £119. Grade Tossa-4 is at £97 and Continental Tossa-2/3 at £86. Crack Daisee-2/3 is available at £93 10s. and grade Daisee-2/3 at £87. Dundee spinners show little interest and only occasional transactions of selected marks take place. Prices for new crop material are irregular. The lowest quoted rates for groups are £108 for Mill Firsts, £91 for Mill Lightnings and £80 for Mill Hearts, c.i.f. U.K., Aug./Sept. shipment. Named marks are available at a premium of £2 to £3 per ton. So far, spinners have placed contracts for limited quantities of new crop fibre and they appear to have secured sufficient for the time being.

The Calcutta goods market has remained remarkably steady during the past month for both hessians and sackings. The increased consumption of burlap by America during March brought a certain steadiness to the market which has been maintained by day-to-day business. The fact that India is now self-sufficient in raw material supplies so far as quantity is concerned has put the mills in a much better position. The outlook for the future is now brighter with stocks of hessians held by the mills at a low level. The sacking position is not so satisfactory and further adjustment in the production of heavy goods may have to take place. Quotations are now at 59s. 9d. for 10 ozs. 40 ins., and at 45s. for 7½ ozs. with 11 ozs. 45 ins. at 65s. 6d. per 100 yds. f.o.b. Calcutta for May shipment and at 59s. 3d., 44s. 9d. and 65s. respectively, June. "B" twills were quoted at 141s. May and at 141s. 6d. June. Due to the larger sacking stocks a discount is offered for early delivery; the reverse is the case with hessians.

Demand for yarns in Dundee has been disappointing. The offtake of jute yarns by the carpet industry is well below normal for the time of year and this is hitting certain spinners. Interest in weaving qualities is also disappointing and in some instances output has been reduced.

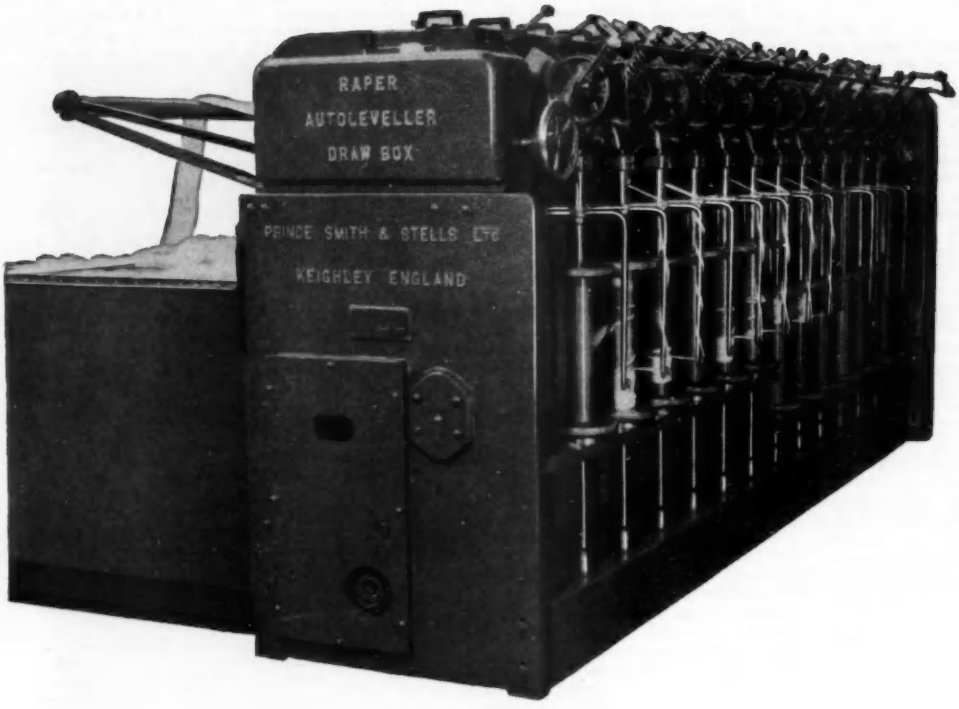
Man-Made Fibres and Fabrics

There have been signs in recent weeks of a slight improvement in the general position. Forward ordering is better and Lancashire dress goods have shared in this over due revival; rayon piece goods, both filament and spun, are certainly in greater demand. There is also far more interest in blended fabrics in cotton and rayon mixtures, etc. Another improvement noted in the past few weeks has been in rayon linings. Acetate is in good call at present with the lining manufacturing trade probably more active than for some time. Cotton and rayon furnishing fabrics are selling better and new screen and roller designs have stimulated some interesting and worthwhile orders. In shirtings, poplins and other cloths of two-fold blends of viscose and cotton, also blends of 67% "Terylene" and 33% cotton are increasing in popularity.

In Yorkshire spinning and weaving sections use of the newer fibres increases steadily. "Terylene" blends with wool in both worsteds and woollens and "Acrilan" in 100% and blends are in good request. There are also interesting developments with "Tricel" for ladies' high-class suitings. So far it is understood quantities of "Courtelle" for the suitings trade have not been very great, but it is being taken up much more rapidly in the knitwear industry for which it is particularly suitable. In the Leek area, for example, the delivery times for double-knit jersey fabrics are lengthening. Most other classes of man-made fibres are in reasonable demand in this area and industry is, on the whole, steady. Rayon sewing threads, also silk and blends of "Terylene"/cotton are all in encouraging request.

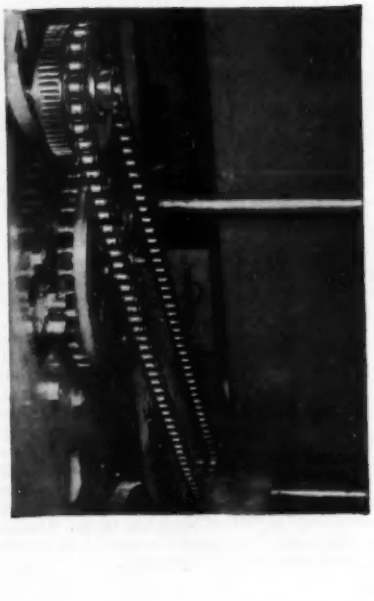
Smallwares manufacturers are rather busier and certain specialities are in exceptionally good demand. Autumn buying has been good and said to have exceeded last year's.

Macclesfield trade is not brisk although throwsters manage to keep running in that the demand for bulked yarns continues steadily. Midland concerns report a steady off-take of Lancashire blended yarns, nylon/cotton probably being the most popular. All nylon and all "Terylene" half-hose remain popular and double-knit jersey fabrics are in request for the autumn trade. "Perlon" is being used rather more widely in ladies' stocking trade. Demand for seam-free nylons is good but margins are extremely competitive.



For quantity and quality

Renold Chain Drive to the front rollers of the Raper Autoleveller Draw Box for worsted yarn



The established field for chain driving in the highest classes of textile machinery owes much to the eighty years of precision chain development by Renold Chains Limited. Modern textile machinery design is keeping pace with the demand for greater output and high quality of product; operational accuracy in related motions is essential — and is ensured by

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Notes and News

The Rubber Industry

In a review of his two years of office as president of the Federation of British Rubber and Allied Manufacturers, Mr. J. Frankenburg, M.A. (chairman, Greengate and Irwell Rubber Co. Ltd.) says that since the rubber industry is already launched on a period of change, it must learn to work with it. If the industry is to remain fully competitive in face of a growing challenge from the consolidation of economic forces beyond the Channel, it will need even more co-operation than it has achieved in the past, more money spent on research, development and modernisation. Above all, Mr. Frankenburg says, we need to be sure that in efforts to meet competition at home and abroad, nothing is done to undermine the sound economic basis on which firms and the industry as a whole must function.

* * *

Townson's Take-Over

William Townson and Sons Ltd., Bolton, have purchased the plant, transport, stocks and work in progress of William Ryder Ltd., Beehive Works, Folds Road, Bolton. The existing staff and workpeople have been re-engaged and the company will continue to manufacture sanitary and hospital fittings and to do repair work, including flyer repairs. A new company, Ryders (Lancashire) Ltd., is being formed to take over this work and the company's address is unaltered.

* * *

Marley Acoustic Pyramid

THE Marley acoustic pyramid is formed from rigid P.V.C., perforated, and filled with mineral wool. The base of each pyramid is 22 ins. square, including a ½-in. flange; the depth is 8½ ins. When noise is made, it goes out in cycles of certain frequency, striking surfaces which absorb a little of the sound but which reflect most of it; consequently the noise tends to build up. Reverberation time—i.e., the time between the sound stopping at source and the dying of the echoes—needs to be controlled. If the sound meets few surfaces, there will be less reflection but also less absorption— therefore the reverberation time will be extended.

When sound reaches the Marley pyramid a large proportion of it is absorbed, and unwanted reflection is eliminated; there is very little "come-back." At a frequency of 1,000 cycles per second the absorption of these pyramids is claimed to reach the exceptionally high value of 95% and for all frequencies from 125 to 2,000 cycles per second, the absorption exceeds an average of 60%.

The number of pyramids, and their positioning, can be calculated on acoustical engineering principles to give the best possible result and Marley Tile Co. is prepared to make specific recommendations for the reduction and control of sound in any given building. Marley acoustic pyramids are fixed easily and quickly on to any firm surface—including sloping ones.

Scots Win U.S. Awards

Three Scottish manufacturers have won gold medals at the International Fabric Exposition of the California State Fair. They are A. and J. Nacnab, Slateford, Edinburgh—who won two medals—and John Lawson and Sons Ltd., Kilmarnock. The Kilmarnock firm were awarded their medal in the woven worsted section for a piece of Culloden tartan cloth. The two medals awarded to the Edinburgh firm were for exhibits in the section for woven patterns in wool. One was for a Shetland sports coating cloth, the other being a saxony 15-oz. cloth featuring the Guisachan district check.

For the second year in succession Andrew Stewart (Woollens) Ltd. won one of the coveted gold medals at the International Fabric Exposition of the California State Fair with a handwoven Shetland tweed of very soft shades of heather pink, mauve and green subtly merged in typically Scottish pattern of checks and overchecks. Designed by Mr. W. Stewart, managing director of the firm, the cloth was woven by Mr. M. R. Duncan, of Collafirth, Shelting, Shetland.

* * *

New Marketing Campaign for British Nylon Goods

British Nylon Spinners Ltd. are about to embark on the most far-reaching marketing operation they have ever attempted. This will be carried out by one of the greatest advertising, merchandising and promotional campaigns in the textile history of Britain. To give the fullest possible support to manufacturing and distributive sections of the textile industry, B.N.S. are promoting two new brand names, Bri-Nylon and Bri-Lon, to identify selected merchandise made from their nylon yarns. With the threat of more intensive foreign competition, and the obvious dangers of cut-price and dumped goods, B.N.S. consider that ready identification of British nylon goods will be of lasting benefit to the trade and consumers. Leading manufacturers in clothing and household textiles trades will use these names to describe their nylon merchandise. They are entering into legal agreements with B.N.S., becoming registered users of the two B.N.S. brand names; by this procedure, B.N.S. can ensure that only the right type of nylon has been used for the particular end-use.

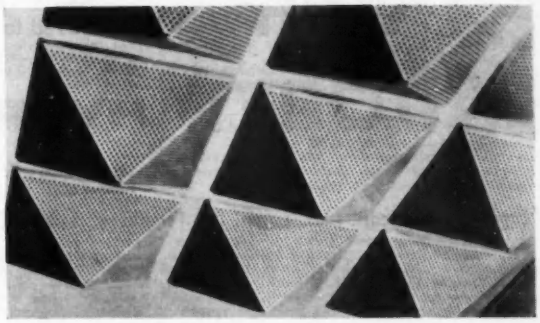
The new names, Bri-Nylon and Bri-Lon, will be promoted by powerful promotional campaigns and the main consumer campaign, in the press and on commercial television, will be in Autumn 1959. These are only opening stages of a long-sustained promotion, planned to establish the fact that merchandise marked as Bri-Nylon or Bri-Lon is British throughout, is made from the right kind of British nylon used in the right way and is a worthwhile purchase. The reason for two names is primarily to help the consumer recognise as nylon the many very different types of nylon merchandise. Nylon now appears in many unfamiliar forms, such as brushed and bulked fabrics, that many consumers do not realise these share the sturdy practical qualities of the standard nylon they know so well. In general, the name Bri-Nylon will be used for clothing and household textiles made from standard filament yarns. Bri-Lon will be used to describe goods made from bulked yarns and brushed fabrics, notably soft to the touch. The many names for processed nylon yarns which are at present creating some confusion both for the distributive trade and the public can thus be incorporated under the single name Bri-Lon.

* * *

Wool Consumption Increasing

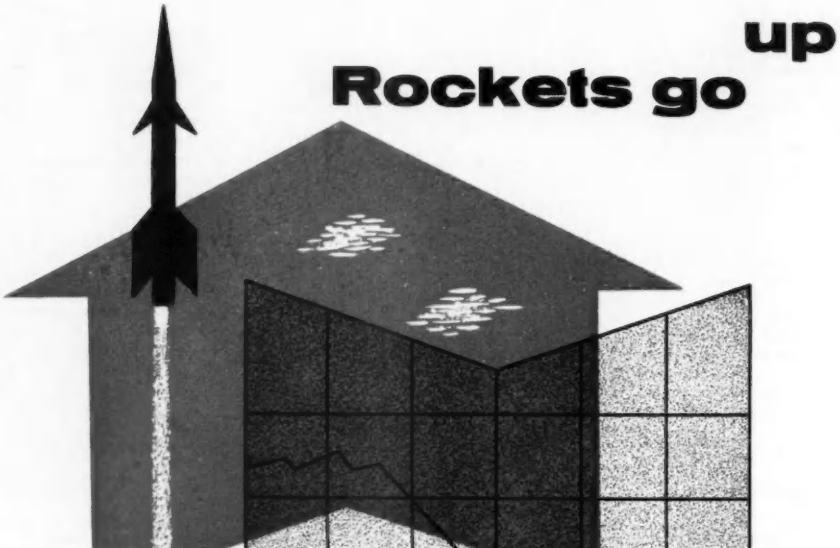
The recovery in world wool consumption, which began in the fourth quarter of 1958, continued at about the same rate in the first quarter of this year, according to the Commonwealth Economic Committee. In ten chief consuming countries, wool usage in the Jan./Mar. quarter was 455·3 million lbs. (clean weight), compared with 451·7 million lbs. in the final quarter of last year, an increase of 1% and of 6%, compared with the first quarter of 1958. The rate of activity increased markedly in the U.S., the U.K. and Japan, but declined sharply in France; reductions were also recorded in Italy and West Germany.

In the U.S.A., the increase last quarter was 12% compared with the previous quarter and 41% compared with the first quarter of 1958. In the U.K., the increases were 5% on the previous quarter and 9% on a year earlier, and the corresponding figures for Japan were increases of 7% and 26% respectively. Declines compared with the previous quarter were 19% in France, 9% in West Germany and 8% in Italy.



A group of Marley acoustic pyramids in position

Rockets go up



Bleaching costs come down

A vital power force for rockets... a safe bleaching agent for all fibres. These are only two of the many applications for Laporte hydrogen peroxide. Increased production is meeting this growing demand and helping to lower your bleaching costs by supplying you with hydrogen peroxide at greatly reduced prices.
Laporte Textile Technical Service Department will be pleased to give advice on individual bleaching problems.

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51

Total consumption of materials other than virgin wool by the wool textile industries of nine chief manufacturing countries in the first quarter also rose by 1% compared with the previous quarter. The proportion of virgin wool in total consumption of materials in these countries thus remains unchanged at 58¼%, though this percentage is one point higher than in the first quarter of 1958.

* * *

SQ Caledon Grains

I.C.I.'s well-known Caledon range of vat dyestuffs are now available in grain form. The SQ Caledon Grains (SQ stands for "superfine quality") are specially designed to meet the needs of operators of continuous dyeing processes involving padding. They are notable for their high rate of reduction, fine controlled particle size when dispersed, and their uniformity of deposition in padding and low tendency to migrate during any subsequent drying of the padded goods. The high reduction rate ensures rapid reduction and high colour yield, in continuous processes involving "flash" reduction times, for example, pad-steam and pad-Standfast molten metal processes. Excellence in all these respects has been the paramount consideration in developing SQ Caledon Grains.

* * *

Lightweight Spray Gun

A NEW automatic spray gun, the L540, made by Alfred Bullows and Sons Ltd., Long Street, Walsall, supersedes the L500 model. A forged aluminium alloy body has allowed the company to reduce the weight of the L540 to less than half that of the L500 (19½ against 41 ozs.) without reducing efficiency; they have also retained interchangeability of internal component parts.

All hoses come away in the line of the gun. This feature allows the new gun to be used in positions and at speeds previously considered impossible. Nozzle set-ups are interchangeable with those used on the Bullows-Binks L1900 spray gun.

Processing Assistant Aids Spinning

Cirrasol AR, a new water-soluble anionic product introduced by the Dyestuffs Division of I.C.I. Ltd., is a carding assistant and spinning lubricant when producing carpet yarns of viscose rayon, rayon/wool, or viscose/protein fibres, and for the treatment of tufted rayon carpets to prevent soiling. On the modified cotton and flax systems, it can be used as lubricant for the coarser types of viscose rayon staple and blends of viscose rayon with wool. Since Cirrasol AR is water-soluble, the subsequent scouring prior to dyeing need only be very mild, and in certain cases may be omitted entirely. When Cirrasol AR is used as a soil-resisting agent the dyed carpet may either be treated in Cirrasol AR solution in the dyeing machine, or afterwards by spraying. In all cases, whether using Cirrasol AR as a lubricant or soil-resisting agent, the application of 1·5% is recommended. I.C.I. Pamphlet No. 99 gives information on the use of Cirrasol AR with viscose rayon yarns or carpets, while Technical Information No. 371 deals with its applications as a woollen system spinning lubricant.

* * *

Border Mill to Reopen

Gala Mill, Galashiels, partially closed for almost two years, is to be reopened following the decision of three Scottish woollen firms to combine to form Gala Mill Holding Co. for the purpose of purchasing the mill premises. The three are Keddie, Gordon and Co. Ltd., Netherdale Handloom Weavers Ltd., and Maxwell Schofield Ltd. Keddie, Gordon and Co. Ltd. plan to move all their machinery and workers to Gala Mill and close their present factory. Netherdale Handloom Weavers Ltd. will continue their business at Glenfield Mill and will use only office and wareroom accommodation at Gala Mill, and Maxwell Schofield Ltd. will continue as at present.

* * *

B.M.M.F.F. Production Figures

Production of man-made fibres in April was 36·87 m. lbs., compared with 37·22 m. lbs. in March, and 36·89 m. lbs. in April last year. Of this, continuous filament yarn was up on the previous month at 18·63 m. lbs. in April compared with 18·17 m. lbs. in March. Production of staple at 18·24 m. lbs. was well done on the March figure of 19·05 m. lbs., and on the April 1958 figure of 20·92 m. lbs. The improvement in output of filament yarn can be attributed to larger production of high tenacity filament rayon for the tyrecord trade. Viscose rayon accounting for more than 75% of the total of all man-made fibres naturally continues to be the main influence in the month to month fluctuations in production.

New Companies

David, Flower and Co. Ltd. Private. Reg. March 23. Capital £15,000 in 14,900 6% cumulative redeemable preference and 100 ordinary shares of £1 each. Fashion artists, designers, cotton spinners, doublers, etc. Solicitors: Howard Kennedy and Co., 19 Cavendish Square, W.1.

Bradford Textile Society Ltd. Reg. March 25, limited by guarantee without share capital. Objects: To acquire the undertaking of the unincorporated "Bradford Textile Society." Registered office: Cheapside Chambers, 23 Cheapside, Bradford.

Turner Brothers (Candlewick) Ltd. Private. Reg. March 25. Capital £5,000 in £1 shares. Manufacturers and dealers in all kinds of tufted textile products, etc. Registered office: 23 Huddersfield Road, Elland.

Ladbroke Weaving Co. Ltd. Private. Reg. March 26. Capital £2,000 in £1 shares. Registered office: Almco Works, Waterloo Road, Cheetham, Manchester 8.

Gordon Rycroft Ltd. Private. Reg. March 26. Capital £75,000 in £1 shares. Merchants and manufacturers of woollen, worsted, mohair, cotton and silk goods and manufactured fabrics, etc. Registered office: Bowling Green Mills, Thackley, Bradford.

Hirsch, Son and Rhodes (Futures) Ltd. Private. Reg. March 26. Capital £10,000 in £1 shares. "Futures" brokers in any commodity whatsoever for which there exists a terminal market, etc. Registered office: 8 Broad Street, Manor Row, Bradford.

Platt, Haworth and Co. Ltd. Private. Reg. March 31. Capital £24,000 in £1 shares. Spinners, doublers, dyers, bleachers, etc. Registered office: 18 Tariff Street, Manchester.

B. Siegel (Nottingham) Ltd. Private. Reg. March 31. Capital £5,000 in £1 shares. Lace manufacturers. Registered office: 42 St. Mary's Gate, Nottingham.

Even-Lay Felts Ltd. Private. Reg. March 31. Capital £15,000 in £1 shares. Manufacturers, and dealers in wool, woollen and woollen mixture felts and waddings, etc. Registered office: Oak Mills, Spa Street, Ossett, Yorkshire.

Bridge Combing Company Ltd. Private. Reg. April 1. Capital £10,000 in £1 shares (5,100 "A" and 4,900 "B"). Woolcombers. Solicitors: Slaughter and May, 18 Austin Friars, E.C.2.

Hosiery Investments Ltd. Private. Reg. April 1. Capital £93,670 in £1 shares (28,900 "A" redeemable preference, 31,687 "B" redeemable preference, 100 "A" ordinary, 6,813 "B" ordinary, 21,170 "C" ordinary and 5,000 "D" ordinary). Objects: To acquire the entire issued share capitals of Notts Hosiery Co. Ltd., Scott and Slack Ltd., and Samuel Eldon and Son Ltd., and to acquire the registered trade mark "Plaza" now registered in the name of Plaza Hosiery Ltd. Solicitors: Bailey and Co., 30 Welbeck Street, W.1.

Permo Spinning Ltd. Private. Reg. April 1. Capital £600 in £1 shares. Objects: To acquire patents, etc., in connection with textile and other machinery, etc. Registered office: Moss Bridge Mill, Moss Bridge Road, Rochdale.

Viccars and Wheeler (Bradford) Ltd. Private. Reg. April 2. Capital £400,000 in £1 shares. (150,000 6% cumulative preference and 250,000 ordinary). Wool merchants and top makers, etc. Solicitors: Whetstone and Frost, Leicester.

Fearsonia Ltd. Private. Reg. April 2. Capital £1,000 in £1 shares. Manufacturers and dealers in worsteds, yarns, etc. Registered office: 11 Herbert Road, E.17.

Tinsel Products Ltd. Private. Reg. April 2. Capital £10,000 in 5,000 7½% cumulative preference and 5,000 ordinary shares of £1 each. Tinsel, textile manufacturers and dealers in fancy goods. Registered office: Porchester Works, Porchester Road, Mapperley, Carlton, Notts.

Walker and Adler Associated Jute Company Ltd. Private. Reg. April 2. Capital £1,000 in £1 shares. Manufacturers and dealers in sacks, bags, canvas, hessian, linen, cotton, hemp, flax, jute, etc. Registered office: 18-21 Marshall Gardens, London, S.E.1.

J. C. Groves Ltd. Private. Reg. April 3. Capital £15,000 in £1 shares. Lace manufacturers. Registered office: Springfield Mills, Sandiacre, near Nottingham.

Joseph Hopkins Ltd. Private. Reg. April 3. Capital £500 in £1 shares. Buyer in England for Greenchilds, Hodgson Racine Ltd. of Montreal and John Forsyth Ltd. of Kitchener, Canada, etc. Registered office: 14 St. Peters Square, Manchester 2.

D. O. McCallum Ltd. Private. Reg. April 3. Capital £5,000 in £1 shares. Merchants, manufacturers and dealers in woollen waste, rayon, wool, worsted, silk, linen, cotton and other fibrous materials, etc. Registered office: 50 Croft Street, Bradford.

S. Wadsworth and Son Ltd. Private. Reg. April 3. Capital £2,500 in £1 shares. General engineers, textile machinists, etc. Registered office: Hollins Mill Lane Ironworks, Sowerby Bridge, Yorkshire.

Westside Wool Co. Ltd. Private. Reg. April 3. Capital £5,000 in £1 shares. Textile manufacturers and weavers, etc. Registered office: 155 Swan Arcade, Bradford.

Sandy Manufacturing Co. Ltd. Private. Reg. April 6. Capital £1,000 in £1 shares. Manufacturers, exporters and importers, wholesale and retail dealers in cloth, tweeds, wool and woollen goods, etc. Registered office: 19 Laindon Road, Sandy, Beds.

Barke Machinery Ltd. Private. Reg. April 7. Capital £5,000 in £1 shares. Machinery agents and merchants, etc. Registered office: 100 Portland Street, Ashton-under-Lyne, Lancs.

B. and Son (Bradford) Ltd. Private. Reg. April 8. Capital £15,000 in £1 shares. Textile machinery engineers and garage proprietors. Registered office: 136 East Parade, Bradford.

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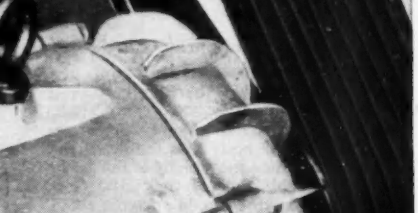

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RECENT TEXTILE PATENTS

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795,496 Yarn Break Disconnects Knitting Machine Drive

ETABLISSEMENTS GARNIER-LUNEAU, 14 *rue de Dijon, Montceau-les-Mines, France.*

Apparatus for the automatic disconnection of a knitting machine, being particularly of interest on the Komet machines upon breaking of one of the rubber threads. The apparatus has a feeler secured to a horizontal spindle, the feeler resting on the thread and being rigid with a member supporting the offset end of a cranked slidable rod carrying a projection lying ordinarily out of the path of a rotary member forming part of the knitting mechanism. Whenever the thread breaks and the feeler rocks to remove the member from under the offset end of the rod, the rod pivots and brings its projection into the path of the rotary member, which produces a shifting of the rod. The free end of the rod then exerts a thrust on a member controlling the disconnection of the machine from its driving means.

796,168 Continuous Bleaching and Dyeing Machine

E. M. J. LARCHER *Villa Ta-Ala Rue de Calavon, Casablanca, Morocco.*

A machine for continuous boiling, dyeing or bleaching, comprises a U-shaped tank through which the material may pass from the top of one arm of the U which forms an inlet arm to the top of the other arm. Means are provided for circulating liquid from a point near the top of the inlet arm to a point near the bottom of the tank. The outlet arm has at least a part of narrower cross section than that of the inlet arm, and the loop of the U joining the inlet and outlet arms comprises two parts, one of which has a cross section decreasing from a cross section the same as that of the inlet arm to a cross section the same as that of the outlet arm. The liquid bath may circulate inside the tank continuously and under a pressure which is equal to the pressure drop caused by the materials which are being treated.

796,288 Beating-up Mechanism for Circular Weaving Looms

H. J. COOPER, 9 *Beechwood Grove, Dun Laoghaire, Dublin.*

Beating-up means for circular looms has movable blades forming between them channels to accommodate warp threads in advance of the fell. The blades are made to remain, at all times in engagement with all the threads of the warp in order to avoid accidental disarrangement of the relative positions of the blades and all of the warp threads and also to keep all of the warp threads from crowding together. Each blade preferably has a stud engaging a cam slot in a side face of a cam ring adapted to be rotated at shuttle speed and operate the blades successively. A beating-up shoulder on each blade is in a retracted state whilst a shuttle is inserting that part of a pick which registers with it, and is advanced to beat-up the part of the pick after the same has been laid, and is thereupon returned to its retracted state prior to the insertion of the corresponding part of the next pick.

796,289 Constructing Loom Pickers

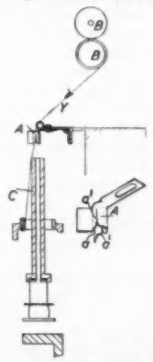
J. W. STOTT, 15 *Hutchinson Road, Rochdale.*

Describes a picker which has increased strength around the spindle holes and particularly that part of the picker which contacts the buffer, in order to extend the life of the picker and to permit the full utilisation of the striking part of the picker which contacts the shuttle tip. The picker has a reinforcement which extends from the bottom of and through the striking faces of the picker to positions beyond the spindle holes, and, adjacent to each spindle hole, a reinforcing blister is formed on the front and rear faces of the picker.

796,352 Preventing Faulty Yarn

G. A. WHITE, 10 *Verdure Avenue, Bolton.*

An improved device for a ring frame which in the event of an end breaking will sever the broken end and thus prevent the formation of faulty yarn. The device comprises a cylinder A having a slot *a* for threading the yarn, and a V shaped recess a^1 at one or both sides of the slot. The two sides of the slot are preferably flared outwards to assist in threading the yarn through the slot. It is preferred to provide two recesses a^1 so that the yarn will be prevented from being drawn forward with the yarn passing to the adjacent spindle at

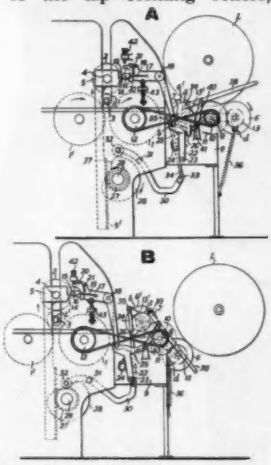


either side. A further V-shaped recess may be formed at the back of the tube to prevent the yarn from being drawn forward with yarn on the opposite side of the frame. The edges of each recess are chamfered to form cutting surfaces. The device is mounted between the front rollers B and the spindle C such that the yarn will pass through it in a vertical path. The yarn *y* is threaded into the cylinder A through the slot *a* and does not normally engage either of the recesses a^1 but should the yarn break and become entangled with an adjacent yarn it will be drawn into a recess and into contact with an edge which will act as a knife to sever it thereby preventing the yarn being drawn forward with the adjacent end.

796,463 Improved Lap Forming Machine

KANEGAFUCHI BOSEKI KABUSHIKI KAISHA, 1612, *2-chrome, Sumida-machi, Sumida-ku, Toyko, Japan.*

Apparatus is described for shaping laps in a lap forming machine of the type having a pair of lap forming rollers, rack bars for loading the lap, a lap roller which is rotated by contact with the lap-forming rollers, and means to eject the completed lap and deliver a fresh empty lap roller. A pair of parallel lap shaping rollers are disposed in front of the lap forming rollers, the



shaping rollers being adapted to receive a lap ejected from the lap forming rollers. Means are provided for adjusting the relative positions of the lap shaping rollers whereby the front roller will be lower than the other roller for discharging a formed lap. A is a side view of a lap-forming machine having a lap-shaping apparatus showing the normal state of operation of the machine and B is a view showing the grooved lap-shaping rollers swung or inclined forwardly to roll the lap out.

796,497 Improved Cloth Inspecting Tables

W. E. YATES LTD., *Wellington Mills, Bramley, Leeds,* and S. WAUGH.

An improved table for the inspection and mending of fabric. The table comprises a frame 1 having mounted at one side a wooden supporting surface 2 which is adjustable so as to be capable of being held in an inclined position relative to the frame by means of struts 3 which engage the frame and the underside of surface 2. The frame has a curved partition plate 4 which extends from the front edge 5 of the frame to the opposite side of the frame at a point 7 at which is also provided a panel 8 which with the partition plate 4 constitutes a retaining trough for the material 9. The mounting 10 of the surface 2 is adjustable so

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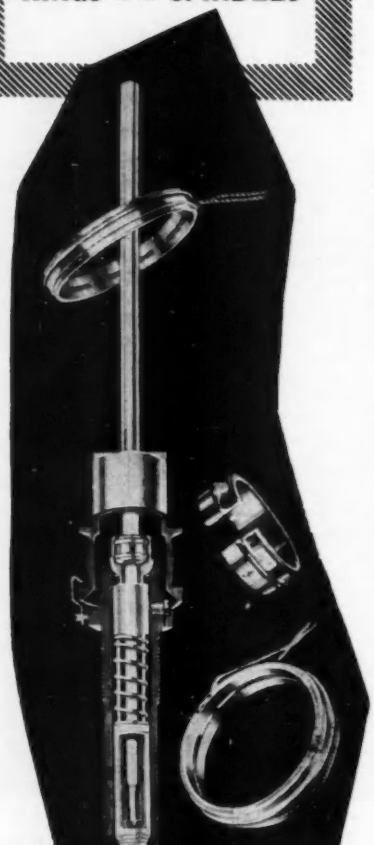

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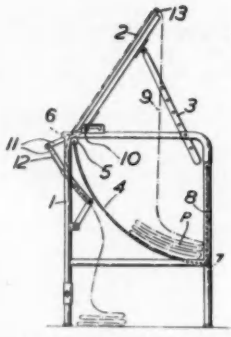


that the edge 6 can be moved relative to the edge 5 of the partition plate 4 with the result that the material coming off the supporting surface can pass on either side of the dividing partition as desired. Connected by links 11 to the surface 2 are guide plates 12 extending along the frame 1 and capable of moving towards or away from the partition plate when the surface 2 is adjusted at its mounting 10. In operation the material is placed in the trough as at P and the end brought over the edge 13 of the surface 2 and passed down between the plate 4 and the guide plates 12, the surface 2 being in the adjusted position whereby the entrance to the trough side of the dividing plate 4 is closed. When the piece has been inspected, in order to inspect the other side it is only necessary to pick up the trailing end and pass it beneath the table and over the edge 13. The mounting 10 is adjusted so that the material leaving the surface passes into the trough and on completion of the examination, the piece is back in the trough in the same way as it was placed originally.

796,513 Hopper Feed Mechanisms

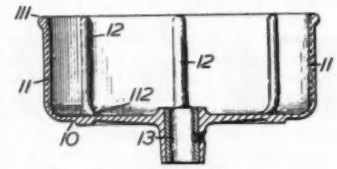
J. E. CROWTHER LTD., *Bank Bottom Mills, Marsden, Huddersfield.*

A hopper feed mechanism in which a travelling spiked lattice conveys material out of the hopper, is provided with a stripper for the sheet, the stripper being mounted for oscillation adjacent to the sheet, and being provided with two or more combs set one behind the other in the direction of their movement. Preferably the combs are disposed on an arc which is eccentric to the pivoted axis of the stripper, the arc being such that the first comb to sweep past the sheet is set further away from the sheet than the next comb. Means may also be provided for adjusting the position of the combs relatively to the sheet.

796,534 Spinning Cans for Cop-Spinning Machines

PLATT BROTHERS AND CO. LTD., *Hartford Works, Oldham.*

Improved spinning cans used in cop-spinning machines for supporting the roving packages. The can 10 is provided on the interior face of the wall 11, with spaced ribs 12, which may extend from the rim 111 to the periphery of the base at 112. The cake is caused by centrifugal force to be pressed against the ribs 12, which thus

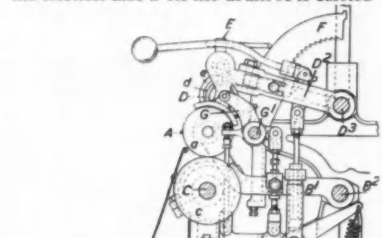


serve to prevent rotary movement between the package and the can. The shape of the ribs 12 is unimportant. They may be rectilinear, or they may be arranged in wavy or zig-zag fashion, or they may be made with small bulges. Whilst certain metals are suitable for the cans, certain synthetic resins are particularly appropriate. Such materials should be chosen for their capacity to resist continuous action by acids and oils at 20°C., in order to avoid damage by the corrosive effect of lubricant adhering to the roving. Where the cans are made of plastic, it is desirable to provide a socket insert 13, preferably of steel of the same character as that of which the spindle is made.

796,545 Automatic Stop Mechanism for Winding Machines

JOSEPH STUBBS LTD., *Mill Street Works, Ancoats, Manchester* 4.

In an improved winding machine, the driving drum A (which has the usual double helical groove) is carried in a cradle supported by an arm B^1 mounted on a stud B^2 and receives its motion from a continuously rotating shaft C. A friction disc *c* is secured on shaft C and drives a similar disc *a* on the end of the drum. The tube on to which the yarn is wound is carried by an expanding mandrel D mounted on a spindle, which is carried by an arm D^2, mounted on a stud D^3. A brake pulley *d*, is at the end of the expanding mandrel D and a brake shoe *e* is carried by an arm E under the action of a spring (not shown) tending to bring it into the position for applying the brake. During normal running of the machine a pivoted quadrant F holds the arm E in a position in which the brake shoe *e* is not in engagement with pulley *d*. A brake shoe adapted to engage the friction disc *a* on the drum A is carried

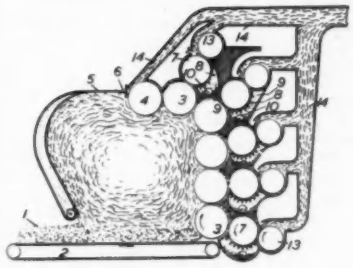


on an arm G, the brake shoe being above the disc *a*, and the arm G is mounted on a stud G_1. The yarn is guided to the mandrel D by a guide eye on the end of a detector wire which co-operates with the setting-on lever H^1 to hold, against the action of the spring H^2, the arms B^1 and G in the winding positions. Should the yarn break the detector wire will fall, the lever H^1 will rise by the action of spring H^2, causing the arms B^1 and G to move about their pivots thereby causing the drum A to be raised away from the driving shaft C towards the brake shoe and the latter to be moved in the opposite direction towards the friction disc *a*. The spring H^2 also causes the quadrant F to pivot about one end thereby releasing the spring which causes the brake *e* to engage the pulley *d* and so apply a brake to the yarn package. Thus the driving drum and the yarn

package are brought to rest in a minimum period of time.

796,568 Improved Cotton Opener, etc.
DODD INVESTMENTS LTD., *Hartford Grange, Wellington Road, Oldham*, R. A. RUSCA, and R. C. YOUNG.

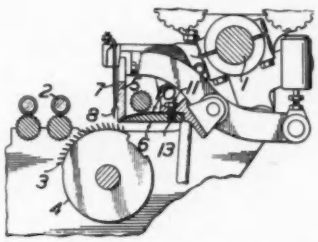
Describes a machine designed to untangle masses of fibres and at the same time removes a large proportion of non-fibrous particles that are mixed with the fibres. Cotton or other fibres are fed on to endless belt conveyor 2, which carries the fibres into contact with the lower cylinder of the series of positively-toothed cylinders 3. The series of cylinders is terminated by kicker cylinder 4 which is a negatively-toothed cylinder, and the wall-like arrangement of cylinders is extended by cover section 5. Stripper bar 6 is mounted adjacent to cylinder 5, to ensure that the kicker cylinder extracts few, if any fibres, and the conveyor and the opener and kicker cylinders are all rotated in the same direction. The cylinders 3 carry the thin layer of fibres they extract on their inclined teeth, and this layer is stripped off by the



action of cylinders 7, which are positively-toothed, lickerin-type cylinders mounted adjacent to the opener cylinders and rotated in the opposite direction. The beater cylinders work in conjunction with grid bars 8 which are deposed in the dead air chamber 9, and the dead air chamber is provided with a spiral blade conveyor 10 as a means for removing trash. After the cotton has been cleaned by the grid bars it is doffed from the beater cylinders by doffer cylinders 13, which can be conventional wire-wound cylinders provided with negative teeth having their forward faces slanted away from the direction of rotation. Suction flue ducts 14 carry away the fibres discharged by the doffer cylinders. the suction flues are connected with the usual means for creating an air current to carry the fibres.

796,570 Improved Heilmann Type Comber
WHITIN MACHINE WORKS, *Whitinsville, Massachusetts, U.S.A.*

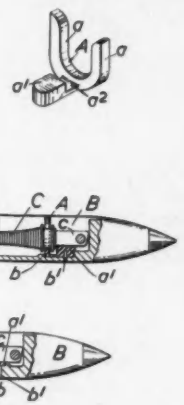
Describes an improvement in combers of the Heilmann type. 1 indicates the oscillating wag shaft by which the nippers are advanced toward and retracted from the detaching rolls 2 above the needles 3 of comb cylinder 4. The upper nipper is marked 5 and the lower nipper is marked 6. At 7 is indicated the top comb plate which carries the needles 8. A spring plate 10 is mounted on top of the cushion plate for bodily movement with it. This plate may be co-extensive with the cushion plate and clamped to it by the bolts 11 which secure the cushion plate to the nipper frame. The forward end of the cushion plate is customarily thinner than the rear end, the top surface of the plate being flat toward the rear and sloping toward the forward end. The spring plate is supported so that its forward end normally is disposed above and spaced from the forward slope of the top surface of the cushion plate. The spring plate extends forward at least to the forward edge of the cushion plate and preferably has a depending lip 14. The length of the spring plate is such that when its forward end is depressed, the lip overlaps the forward end of the cushion plate. As the nipper knife descends it engages the forward end of the spring plate and depresses it, the fibres being held by the knife against the lip of the plate instead of, as customarily, against the tip of the



cushion plate itself. As the fringe is advanced and the knife rises, the flexed spring plate also moves away from the cushion plate, and lifts the fringe toward the needles 8 and into position to enter the roll nip sooner than if allowed to droop toward a lower point of contact with the lower detaching roll. In this way the rolls grasp the fringe sooner and the needles 8 commence to comb the sliver sooner.

796,617 Improved Shuttles
HENRY MILLS AND SON LTD., *Victoria Works, Tottington, Bury.*

In an improved shuttle the retaining clip is of U shape, the two legs *a* of which fit into vertical grooves *b* in the side walls of the shuttle B. A pad a^1 for supporting the head *c* of the tongue C when the latter is in weaving position may be formed separately from the member A and secured



in position by the pin b^1. Alternatively, as shown the member A and the pads a^1 are formed integrally and inserted into the head of the shuttle as a single unit and retained in position by a screw b^1 passing from the underside of the shuttle into the pad. A transverse recess a^2 is formed between the pad and member A to receive the flange of the pirn when the tongue is in the weaving position.

796,729 Tension Control in Raising Machines
C. M. VON HOBE and A. MONFORTS, *Munchen-Gladbach, Germany.*

A method of controlling the operation of a fabric raising machine, in which the tension of the fabric is regulated by adjustment of the ratio between the speed of rotation of an externally driven conveying roller over which the fabric passes before reaching the first raising roller, and the speed of rotation of a further externally driven conveying roller located between two raising sectors or at the end of the raising path. The relative speeds of the two conveying rollers is made dependent on the tension of the fabric at a particular location between the conveying rollers so as to keep this tension at a required value.

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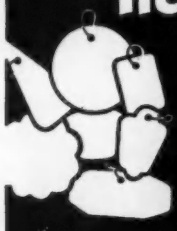

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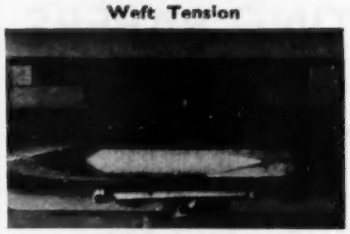

Fabric defects caused by variations in the tension of the weft during weaving can frequently be avoided by measuring the unwinding tension on a "SHIRLEY" Weft Unwinding Tension Meter. By using this robust instrument the tension of the weft can be measured as it is withdrawn from the shuttle; the effect on the tension can be assessed of varying shapes of pirn, linings, etc.

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THE Proprietor of British Patent No. 712187 is prepared to sell the patent or to license British manufacturers to work thereunder. It relates to an "Improved Process for the Manufacture of Yarns of Stiff Hair or Filaments of Synthetic Material Unfit for Spinning." Address: Boult, Wade and Tennant, 112 Hatton Garden, London, E.C.1.

Patents for Sale or Licence

THE Proprietors of Patent No. 743761 for "Improvements in or relating to Method of Producing Fibres, Threads, Yarns, Tows and the Like," desire to secure commercial exploitation by Licence or otherwise in the United Kingdom. Replies to Haseltine Lake and Co., 28 Southampton Buildings, Chancery Lane, London, W.C.2.

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